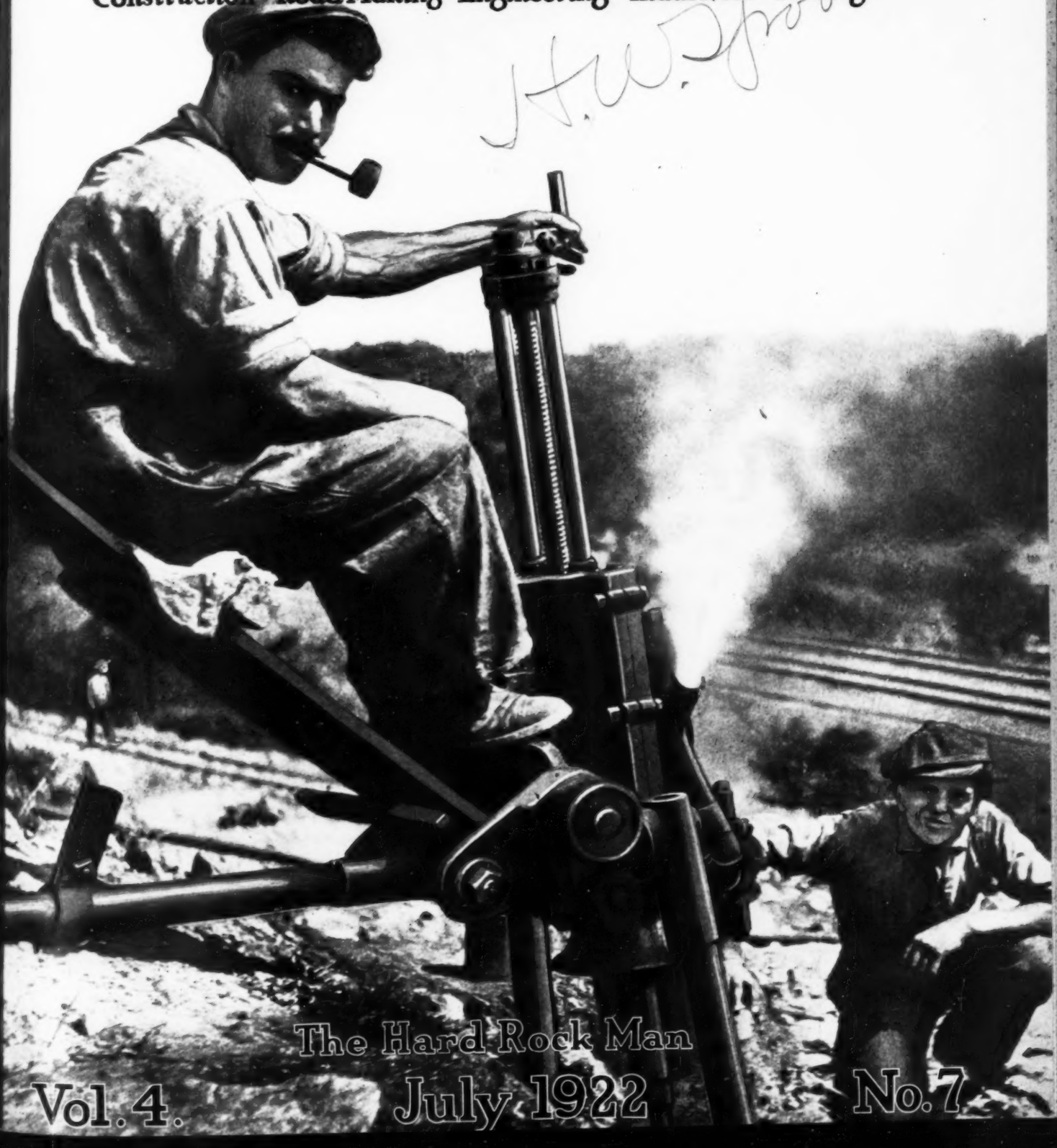
# Successful Methods

Construction - Road Making - Engineering - Industrial - Mining



The Hard Rock Man

Vol. 4. July 1922 No. 7

# Have you seen the 2-ton 4-cylinder Heavy Duty Autocar?

Modern design
Light chassis weight
Short wheelbase handiness
Economy of space in traffic and garage
Low maintenance and upkeep
Availability and low cost of parts
Direct factory branch service
Assured transportation for every commercial need

## A motor truck is only as good as the service behind it

THE AUTOCAR COMPANY, Ardmore, Pa.
Established 1897

# Autocar

## Wherever there's a road

# Successful Methods

*A Magazine of Construction Service*

Published by SUCCESSFUL METHODS, Inc.
F. A. SMYTHE, President
S. T. HENRY, Vice-President and Treasurer WILLIAM JABINE, Secretary and Editorial Director
141 Centre St., New York City, N. Y.

Vol. IV. JULY, 1922 No. 7


## A Chance to Go Ahead

FOR several months the affairs of the American Road Builders' Association have been in a turmoil. Two factions have been fighting for control. Without reviewing the arguments of either side, it is gratifying to know that the association elected on June 15 a group of officers and adopted policies that are apparently satisfactory to all concerned. The association thus is in a position to go ahead and become an organization worthy of representing the great road-building industry of the country.

In the past, the association has largely been a one-man organization, which has held an annual convention that has never even approached in recent years what the road-building industry had a right to expect. In connection with this convention the association has conducted a show of road-building materials and machinery. This show has come to overshadow completely the annual convention, largely due to lack of proper planning and handling of the convention program.

The officers of the association now have a chance to do two things:

First, to build up a membership list of at least five thousand men who properly represent the industry, and then to give this membership real service.

Second, to co-operate with the association that the exhibitors have formed so that the well-founded criticisms against the management of recent shows may be eliminated.

With the support of a reasonable part of those who are and those who should be interested, the officers of the association can make the latter a real factor for good in the road-building industry of the country. They must, however, act quickly, fairly, courageously and energetically. Otherwise, the association will have had its last chance and some new organization will arise to give the industry what it wants in that direction.

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## The Coming Car Shortage

BEFORE the first frost next fall there will almost certainly be a serious railroad car shortage. No inside knowledge of the railroading is needed to foresee this result. The weekly reports on idle cars alone are enough to show how fast surplus rolling stock is being reduced. When these figures are studied in the light of business tendencies, it is only a matter of how long before shippers are clamoring for cars.

There is no need to inquire into why the railroads lack the cars necessary to take care of traffic. That is all well-known history. The facts are that a shortage of box cars is nearly at hand. And this, too, before the 1922 grain crops have even begun to move. There is a big surplus of open-top cars. The coal strike accounts for most or all of these. Once the miners go back to work, the surplus of idle open-top cars will disappear like the proverbial snowball.

Any question about the probable increased demand in the near future for open-top cars can quickly be answered by merely a superficial study of a few facts. In the first place, the country's normal surplus of coal in storage will soon be practically gone. Secondly, very little coal has been shipped to take care of next winter's demand for heating. Meanwhile the steel industry is working under wraps because it does not see where it can get a fuel supply to support an increase in operations. Already the leading interest in that industry is seriously behind in deliveries. At the same time, the demand for steel mill products is picking up faster and faster.

Now is the time for those in charge of construction work to act. Get your materials moving to the job. Store them, even if you have to buy or rent equipment for rehandling. If finances are a factor, talk the situation over with the people for whom you are doing work. Do not sit idly by until the storm breaks. Ship while the shipping is good.

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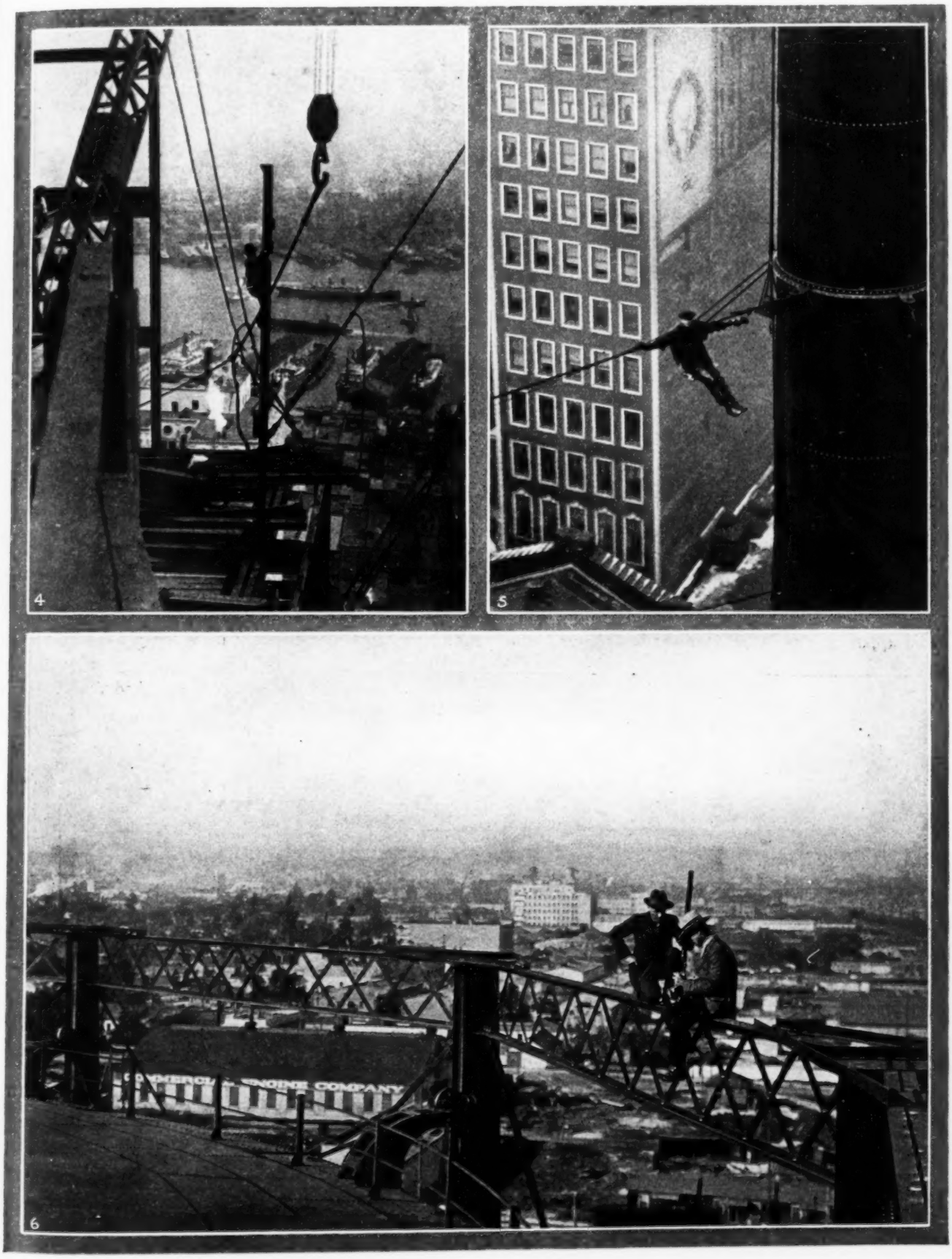
## Go Get Acquainted

THE Brazilian Government has invited the engineers of the Americas to an engineering congress in Rio de Janeiro in September. Leading engineers from all Latin-American countries will attend. Many men prominent in the profession here are going. The United States evidently will furnish much of the money needed for the great engineering works which will be built in Latin America. American engineers and construction men will go with the American financing. The coming congress offers a wonderful chance to get acquainted with a large body of Latin-American engineers in a very short time. It is an opportunity for the improvement of international relations which should not be neglected.

# There's Safety in the Air

1—Going up with a load. This always stops the crowd even in blasé New York. © *International.*
2—Repairing the spires of the Cologne Cathedral in Germany 500 ft. above the ground. © *International.*
3—Lunch time 30 stories up. It's milk in the can, of course, these days. © *International.*

# As These Pictures Prove



4—Erecting steel for a tall building in New York. © *International.*
5—Painting a steel stack 20 stories above the street in Chicago. © *Underwood & Underwood.*
6—Armed guard on a gas tank in Los Angeles. © *International.*

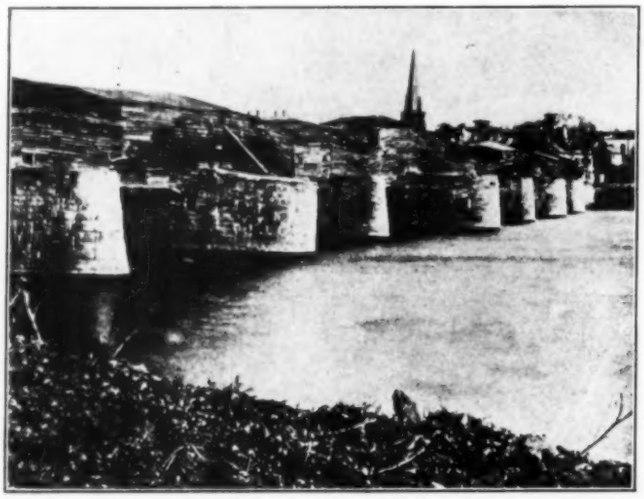
# INGENIOUS METHOD OF BUILDING BRIDGE PIERS

## Shifting Sands Create Problem in Construction of Great Western Gateway

By Gordon P. Gleason.

WITH the abutments and 23 piers of the Great Western Gateway bridge, spanning the Mohawk River at Schenectady, N. Y., completed, the engineering and contracting forces engaged on this work feel that the most trying period in the construction of this remarkable bridge has been successfully passed.

This feeling of relief is due to several factors, the principal ones being: First, that a method was found of overcoming the fine, shifting sands that hindered the work and threatened to create a serious problem, and, second, that all the piers were finished prior to the coming of the early spring floods which sweep down the Mohawk Valley.

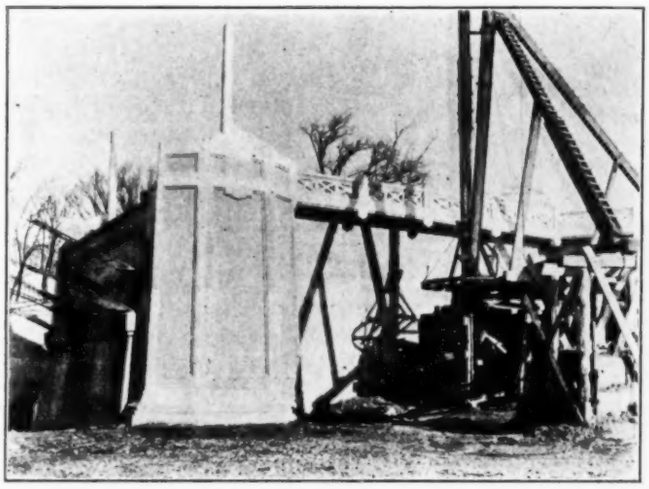


THE OLD WOODEN SUSPENSION BRIDGE AS IT APPEARED IN 1868.

In view of the great interest in the work on the Great Western Gateway, a brief sketch of its inception and history may not be amiss. Early in 1914 it became apparent that a modern structure would have to be erected to replace the old bridge, which was built in 1806, after a design by Col. Theodore Burr, one of the most noted bridge designers of the last century. This early structure was considered a marvel of engineering skill, because of the fact that it was not only a long bridge for its day and age, but for the reason that it was really a wooden suspension bridge, the suspending members consisting of several layers of wooden planking, bolted together. This was improved upon and strengthened from time to time, but finally it was determined to build a new structure, and a different site was selected. Then arose a discussion as to whether a steel or a concrete bridge should be provided. After a thorough consideration of the many problems involved, the reinforced concrete structure now being built was decided upon, and State Engineer Frank M. Williams of New York immediately designed a massive struc-

THIS VIEW AND THE ONE ON THE OPPOSITE PAGE GIVE A COMPREHENSIVE IDEA OF THE SCHENECTADY APPROACH TO THE GREAT WESTERN GATEWAY.

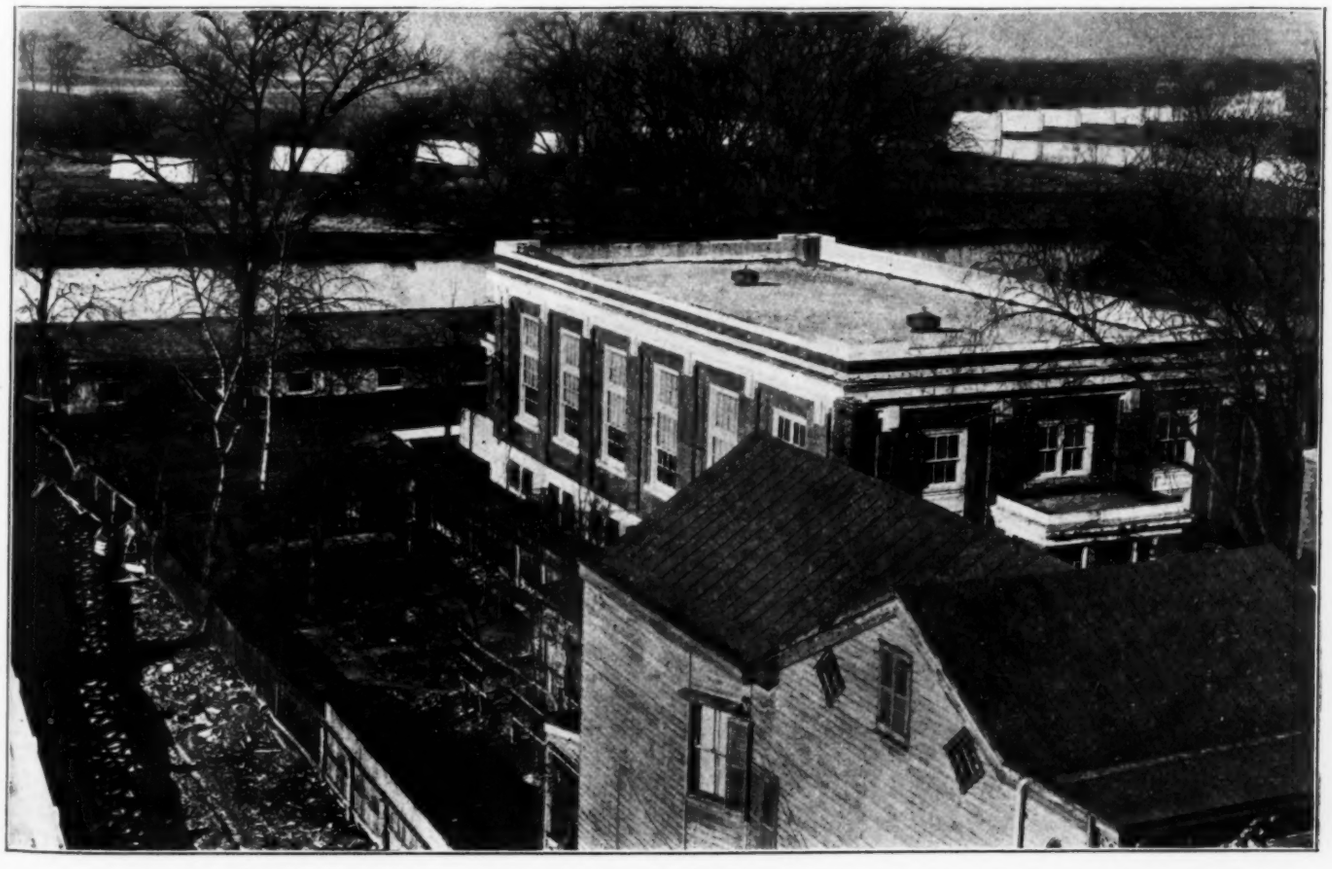
ture, calling for the placing of 23 reinforced concrete piers, 10 of which were to be located in the bed of the Mohawk River, Barge Canal and Canal Terminal channels. As described in the November, 1920, issue of SUCCESSFUL METHODS, the contract was divided into four parts, one for the construction of the abutments, one for the piers, a third for the arches and superstructure, and a fourth for the roadway, balustrades and ornamental work. The first contract was started early in 1920.



ONE OF THE MASSIVE ABUTMENTS OF THE NEW BRIDGE.

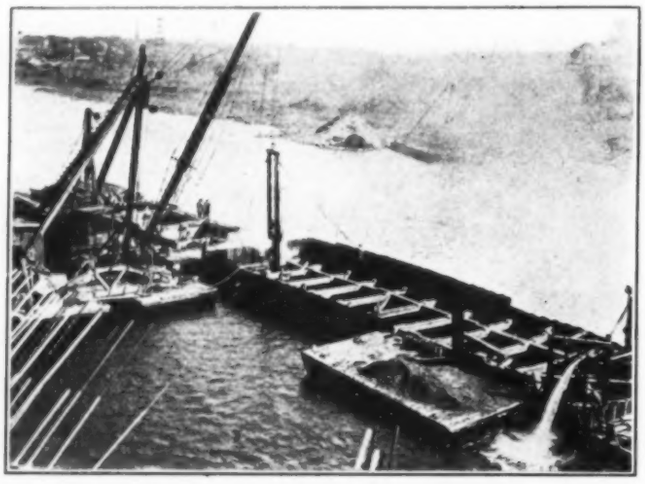
The construction of the abutments involved no great difficulty, but when it came to building the piers several conditions arose which made it imperative to alter the original contract plans somewhat. These plans called for wooden piles, which were to form a cut-off to protect the pier foundations from the action of the water and sand, but as the work progressed, it was seen that the peculiar nature of the soil in the bed of the waterways where the piers are located precluded any possibility of unwatering the steel cofferdam and driving the wooden sheet piling as originally contemplated. As a permanent cut-off was deemed an absolute necessity, the State engineering authorities took up the problem and ultimately agreed that the contractor should drive down the sections of the steel cofferdam, instead of placing wooden piling. This arrangement not only hastened the work of constructing the piers, but provided a cut-off which was almost as cheap as that originally intended, and one which is certain to withstand the action of the sand and water.

Later it was found that local conditions demanded a more substantial piling than wood for pier foundations in the river sections and an ingenious method of meeting this condition was devised. This consisted of driving a hollow metal core or tube into the bed of the stream, all foreign matter being washed out during the driving process by means of hydraulic pressure. With the tube driven to its proper depth, the concrete was poured into it from the mixing scows and floats, a complete pile driving, concrete mixing and pumping outfit being floated to the site of the work and held in place by means of anchors and tugs. During the process of pouring the concrete, steam pres-



THE CONCRETE PIERS SHOWN ABOVE EXTEND FOR 8/10 OF A MILE ACROSS THE MOHAWK VALLEY.

sure was used to force the plastic substance through the tube and out of the bottom, thus causing it to form a knob-like projection far below the bed of the stream. After the concrete within the tube had hardened, the casing was withdrawn, leaving an almost perfect foundation and one which is calculated to withstand the action of the water and sand, as well as the severe pounding to which the bridge will be subjected. In



DRIVING PILES IN THE STEEL COFFERDAM.

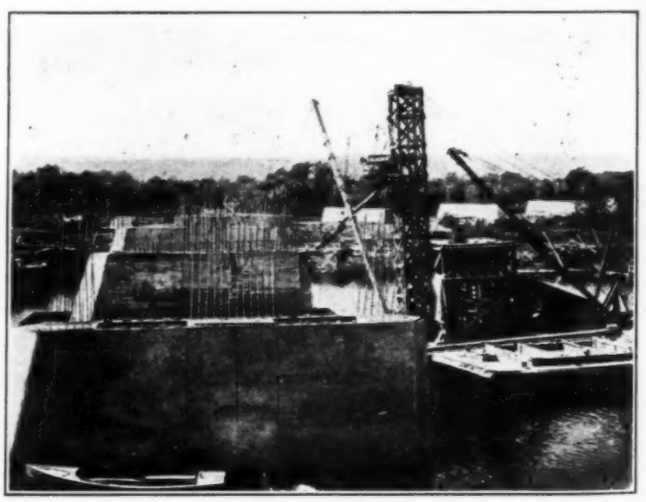
the majority of cases, however, and particularly in the land and island sections, wooden piles were found most suitable, as is demonstrated by the fact that a total of 140,000 lin. ft. of wooden piling was used and that these piles, if placed end to end, would extend a distance of more than 25 miles.

With the piles placed, the important work of constructing the piers themselves was undertaken. In the earth sections this was a very simple matter, the reinforcement of steel bars and the concrete being placed in the usual way. In the river and canal bed, however, this work assumed a very different aspect. It was found that it was extremely difficult to get and keep the interior of the cofferdam dry enough to permit rapid progress. This was due to the fact that no matter how tight the cofferdam was constructed, nor how well it was braced, the water would seep into it through the fine sand, which extended far down. Heavy duty pumps and engines accordingly were brought into play, and by keeping these constantly at work and by building a sort of dam within the cofferdam by means of forms the contractor was able to continue the work at a satisfactory rate of speed and have it completed within the contract period stipulated.

The next phase of the work promises to hold forth much that will be of interest to the contractor and engineer. This is the erection of the superstructure. All the piers have been left with several feet of reinforcement bars protruding and no trouble will be encountered here, but the distance between the piers is 106 to 212 ft. and this will necessitate the most careful and painstaking construction work. The contract plans call for a thickness of 1 to 2 ft. 3 in. at the center or crown of each arch, including the 212-ft. span, and this must have sufficient strength to support the combined weight of interurban trolley cars, heavily loaded trucks and the crowds of pedestrians which cross the bridge daily. To make this possible on the long span which is over the Barge Canal channel and must afford a clearance of at least 15½ ft. at the highest navigable stage of the channel it is planned first to construct a network of steel somewhat similar to that of a steel bridge and place the reinforcement with this filling and covering the whole with concrete. This will give a concrete arch reinforced with steel girders as well as reinforcement bars.

The massive character of the abutments has caused considerable conjecture regarding the size of the structure when completed. Consequently a comparison with the Brooklyn Bridge is of no little interest. That structure is 3456 ft. in length, exclusive of approaches. The Western Gateway is 2186 ft. long, exclusive of approaches, which add 1250 ft., giving the bridge a total length of 4436 ft., or more than 8/10 of a mile.

The construction of the bridge will call for the use of upward of 50,000 cu. yd. of concrete, while the completed structure will weigh in the neighborhood of 110,000 tons. With the work of the superstructure finished, the contract calling for the construction of the roadway and balustrades will be awarded. The plans for this call for a road 40 ft. wide at its narrowest section, while provision has to be made for the wide sidewalks on either side. Balustrades of white concrete will flank the walks, while at each pier there is to be provided a bay or square, which will enhance the appearance of the structure and enable the sightseer to obtain a splendid view, stretching far



VIEW OF PIERS AND FLOATING CONCRETE MIXER.

beyond the line of the sidewalks. In addition to these general arrangements in the design of the Western Gateway, it is to be provided with a series of heavy ornamental posts bearing clusters of high power electric lights. These are to be located at suitable intervals along the balustrade and at the approaches, thus converting the bridge into a miniature Great White Way at night. The approaches are to be so constructed that they will provide for the passage of automobiles, trolley cars, trucks and pedestrians in both directions at one time.

# DAVID T. RIFFLE—A BIG BUILDER

## Pittsburgh Contractor Leaves Spectacular Jobs Alone but Has Plenty to Do All the Time

THE big builders of the country are not necessarily the men who build the big buildings. Far from it. The number of big buildings in the land is an almost infinitesimal proportion of the grand total and to limit a search for the big men of the construction industry to those who have put up skyscrapers, acres of factories or gigantic apartment houses would be the height of folly and unjust in the extreme.

The men who build the common, or garden variety of building, stores, garages, warehouses, schools, churches and a host of other structures that fill the cities and towns of the United States, constitute the backbone of the construction industry. They don't make so much noise as some of the others, but they turn out as big or bigger a volume of useful work, and that is all that counts in the long run.

DAVID T. RIFFLE

David T. Riffle of Pittsburgh belongs to this "backbone class." His jobs are not the big, spectacular ones, but he does about $1,000,000 worth of construction a year and usually has from six to ten jobs going on at once in addition to keeping a couple of estimators busy all the time figuring on new work, the greater part of which is unsolicited.

Unlike the physician, who begins as a general practitioner and later becomes a specialist, Mr. Riffle concentrated his early efforts on a special line and later was practically forced into the general field.

He was born in Masontown, Pa., 47 years ago, and when the time came to settle down to work decided to learn the bricklaying trade, not with the idea of being a bricklayer all his life, but because he thought an anchor to windward in the form of a safe and sane trade, would be a good thing to have in the event that his more independent ventures in money making should prove unprofitable. So he served his apprenticeship with an uncle, learned to be a good bricklayer, and then went to Pittsburgh in 1900 to try his luck. He worked as a foreman on a few jobs, but soon began subletting the brick and masonry work on various buildings from the general contractors, it being the fashion in those days to divide up construction jobs to a much greater extent than is the case today. He was helped into this branch of work by unintentionally hearing a man ask an architect for whom Mr. Riffle was waiting where a good man could be obtained to put up a brick wall. After the architect had departed, Mr. Riffle stepped in, announced his willingness to tackle the job—and got it. He made just enough money on it to convince him that he could do better by managing the work with his head than by performing it with his hands, so he quit the actual work of laying brick and began his subletting career. This phase lasted about five years and then fashions changed. The big general contractors began to handle all phases of their jobs and Mr. Riffle found the brick and masonry work slipping away from him. The only thing to do seemed to be to transform himself into a general contractor and he did so. "You see, I was pushed into it," he explained.

The story of his first job as a general contractor shows about how gently the pushing was effected. He had done the brick work for a big general contractor on the factory of the Damascus Bronze Company and later was sent for by one of the men in the Bronze Company who said that they wanted a one-story addition for an office. "I guess I can handle it. Where are your plans?" said Mr. Riffle. "Plans? We haven't any plans," was the unexpected reply, which rather put it up to the budding contractor.

He withdrew as gracefully as he could, hunted up a friend who knew something about the subject and made the following proposition: "Draw up a set of plans for me and I'll give you $10."

The plans were drawn, the $10 was paid, the building was put up, and David Riffle found himself a general contractor.

Once started, the work kept coming, although for a while there was a period when Mr. Riffle was getting along on what a good friend of his aptly termed "nerve and notes." The nerve is still on the job, but the notes have long since been retired.

Pittsburgh and the surrounding territory are plenti-

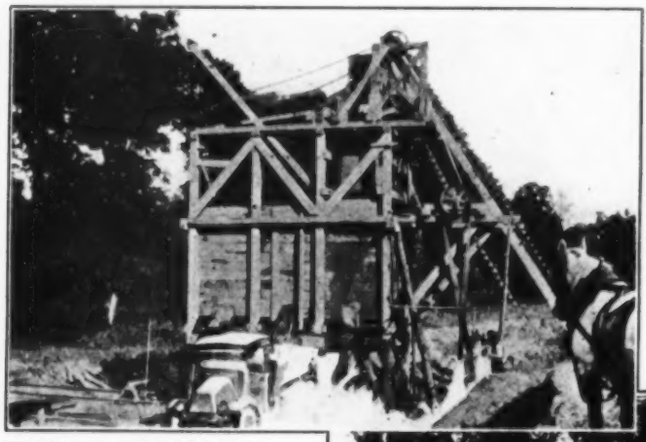
fully besprinkled with buildings of one sort or another that Mr. Riffle has constructed during the last seventeen years. Warehouses, factories, schools, churches —all sorts of jobs usually ranging in cost from $50,000 to $250,000 stand as examples of his skill as a contractor. And a further testimonial to his skill is the fact that his customers keep coming back for more. The two estimators referred to above are kept busy, not by business which Mr. Riffle has to solicit, but by requests for bids which come in from architects and owners with whom or for whom he has worked in the past or who know of him by reputation. And there is no more satisfactory method of getting business than that.

As is natural Mr. Riffle's success in his chosen field has brought him recognition in other forms than money profits. He is now serving his third term as President of the Builders' Exchange, an organization of Pittsburgh construction men with a membership of 460. He also recently was re-elected a member of the Board of Directors of the Pittsburgh Chamber of Commerce, a distinction that is so highly regarded that the pre-election campaign each year closely resembles a national political struggle.

David T. Riffle is a typical American contractor who has made a success of what everyone recognizes as a difficult game. He is only one of a host of such men all over the country who are gradually making contracting the sound business venture that it ought to be.

## BUILT TO WITHSTAND HEAVY TRAFFIC

A ROAD built to withstand a heavy and constant flow of traffic and which will become one of the most important thoroughfares leading into the district has been constructed at West Hyattsville, Md., by the Highway Engineering Company of Washington, D. C. This road is 1 1/10 mi. long and was completed in 30 days, which was record time.



WASHING AND SCREENING PLANT

PREPARED SUBGRADE

This road, which is 15 ft. wide and 6 and 8 in. thick, was constructed from a street mixing plant. Coarse and fine aggregate were transported in trucks from a screening and washing plant which was owned and operated by the company to the mixer located on the road under construction. All material was inspected and O.K.'d both by the State Inspector and the superintendent of the contracting company before being permitted to go to the mixer. After the process of mixing was completed it was again inspected and then placed on the subgrade. The mix was 1:2½:3. A mechanical mixer of the self-propelled batch type with a distributing device was employed to mix the concrete. This device consisted of a chute which conveyed the concrete from the drum of the mixer to its place in the road. After this followed the process of belting and rolling. When the desired smoothness of surface was obtained a blanket of raw material consisting of dirt and sand was placed over the entire section and allowed to remain there for 21 days. At the end of that time the blanket and forms were removed.

Transverse joints were constructed in the pavement ranging in length from 25 to 50 ft. The joints were made by introducing a board about ⅝ in. thick and shaped to conform with the cross section. The board was held in place by means of stakes until the concrete had taken its final set and then it was removed and the opening left filled with bituminous material, thus providing for expansion and contraction of the concrete. Dirt shoulders from 4 to 6 ft. were provided along the entire road.

It is believed that this road will develop a larger agricultural area in the vicinity.

POURING THE CONCRETE

# HANDLING WET CONCRETE WITH CONVEYOR

## Chicago Contractors Find Machine Practical and Efficient on Sewer Job

THE portable conveyor is now being used for loading and unloading almost every sort of dry material, but the Wallbridge Engineering Company of Chicago has demonstrated that this machine works just as efficiently and speedily with wet materials as it does with dry ones. Recently this company was building a sewer and, by using a portable conveyor for pouring the concrete, was able to reduce its working force from 27 to 10 men.

SECTION OF SEWER POURED BY CONVEYOR.

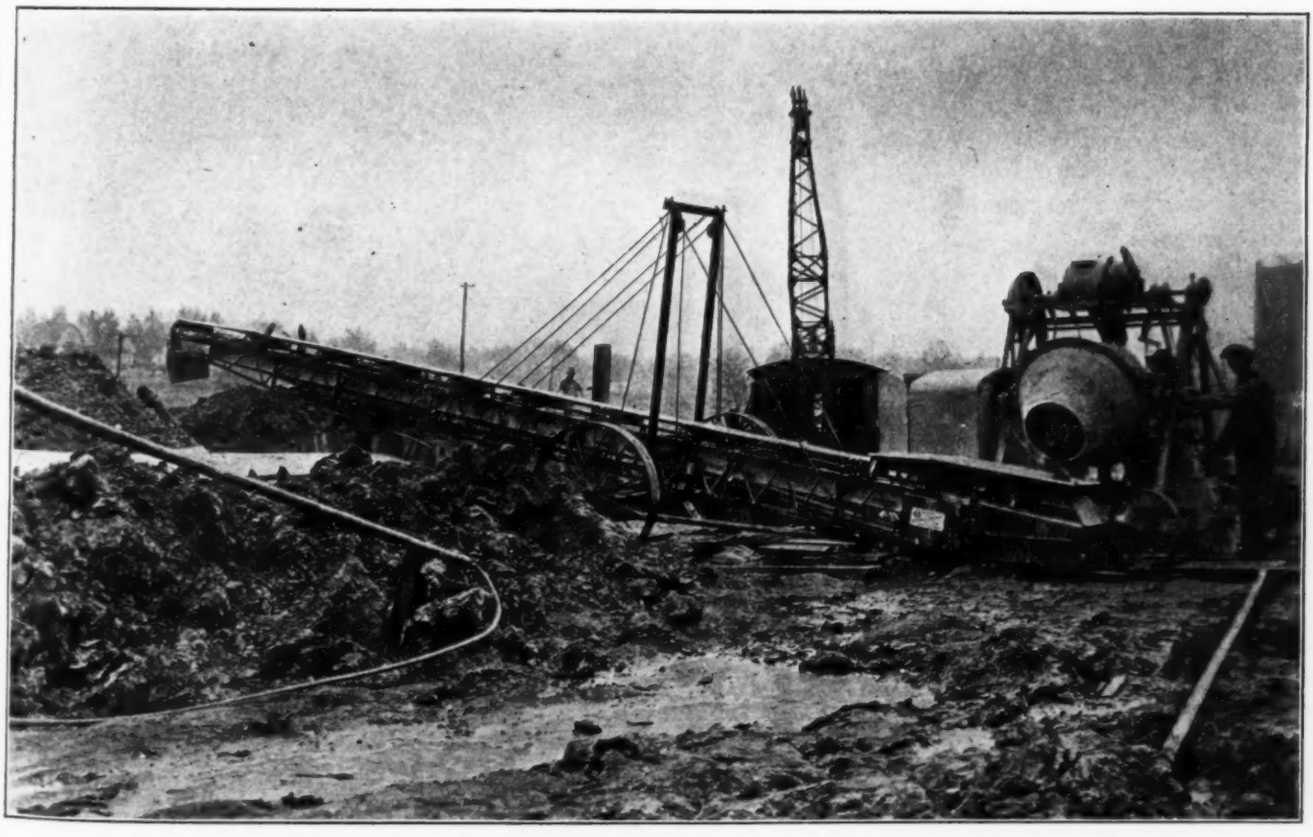
The form shown in the small photograph on this page contains 37 cu. yd. of concrete, which was poured in 2 hours by the conveyor. No particular attempt was made to produce a dry mix, as it was found that the belt would carry concrete of any consistency. In fact, after the first form had been poured, the belt was doused with water to clean it and some of this water was carried up the incline and discharged just the same as if it were concrete.

The conveyor being used by the Wallbridge company is a standard portable conveyor equipped with an 18-in. rubber belt running on troughing carriers. A simple wiper and spout have been added at the discharge end. The spout catches all the concrete and discharges straight down, so that there is no separation of the aggregate. Concrete is discharged directly from the mixer into the hopper end of the conveyor, as shown in the photograph at the bottom of the page.

On a somewhat similar job completed by the Wallbridge company a track was laid parallel to the line of work and a flat car pushed along on the track. On the car the mixer was mounted at a height which made it possible to chute the wet concrete to the forms by gravity.

This meant more work in many ways. The wheelbarrow gang had to push all the sand and gravel up a grade to get it on the car. Several men were required to take up the track and lay it ahead of the car.

J. J. Wallbridge is head of the company and E. J. Gaylord is superintendent on the job described in this article.



CONCRETE IS DISCHARGED DIRECTLY FROM THE MIXER INTO THE HOPPER END OF THE CONVEYOR.

# BIG EARTH DAM WILL ADD TO NEW JERSEY'S WATER SUPPLY

## New Structure Across Wanaque River Presents Many Construction Problems

By R. S. Arthur

An earth embankment about 1200 ft. in length with a maximum height of about 75 ft. having a concrete and puddle corewall carried down to rock 100 ft. or more below the surface of the deepest point, is now in process of construction across the Wanaque River, near Wanaque, N. J. This dam will form a reservoir 6½ mi. long and ⅜ mi. wide, having a daily capacity of 11,000,000,000 gal.

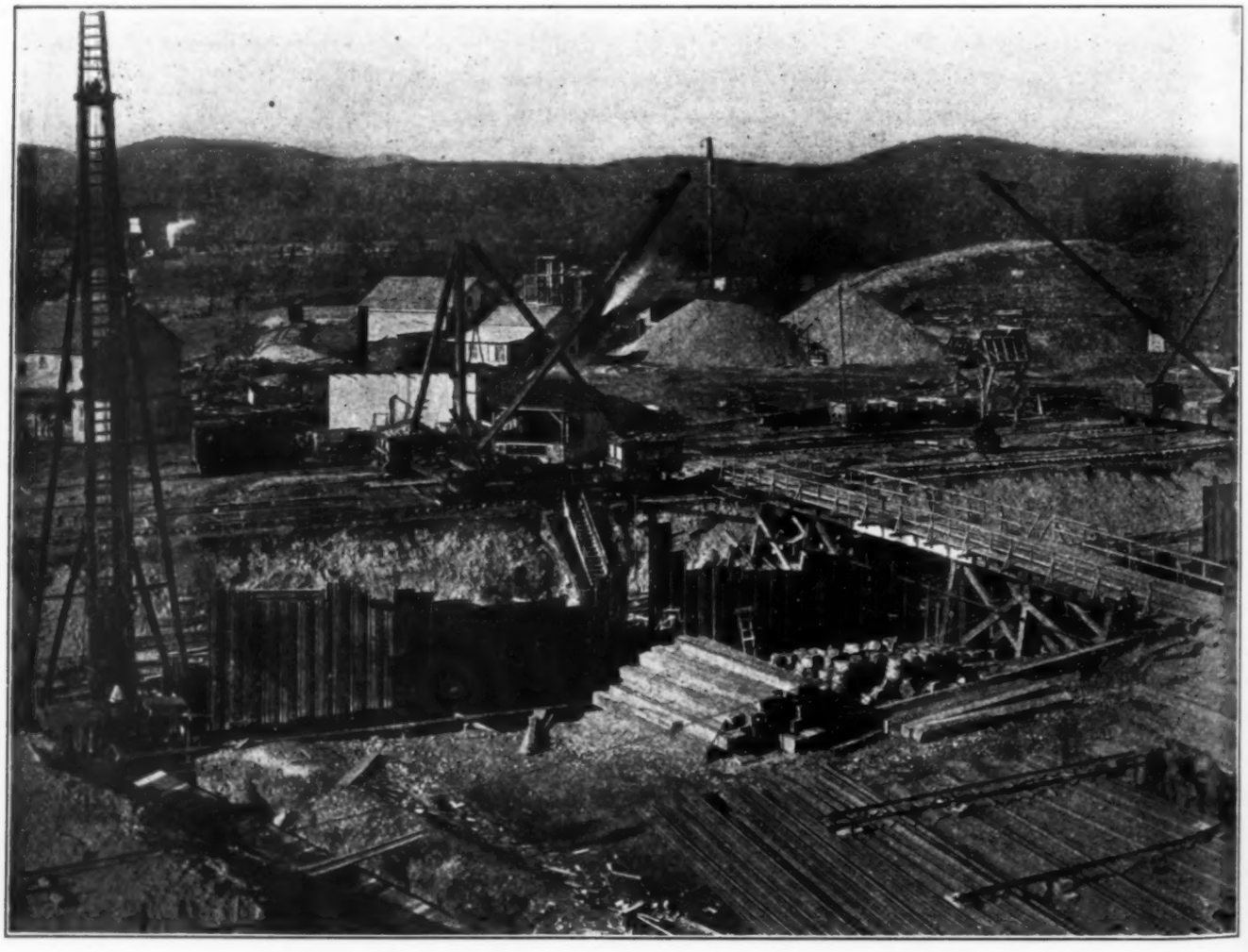
The project, which when completed will be one of the largest earth dams in the country, is under the direction of the North Jersey District Water Supply Commission and the reservoir when completed will supply water for Newark and other municipalities. The ultimate development of the watershed, which has a direct tributary area of 63 sq. mi. and an additional 27 sq. mi. tributary area through Greenwood Lake, will provide for eighty or ninety billion gal. daily.

The contract for the substructure was let in November, 1920, to W. H. Gahagan, Inc., of Brooklyn, and the nature of the work and the conditions encountered brought out some interesting methods.

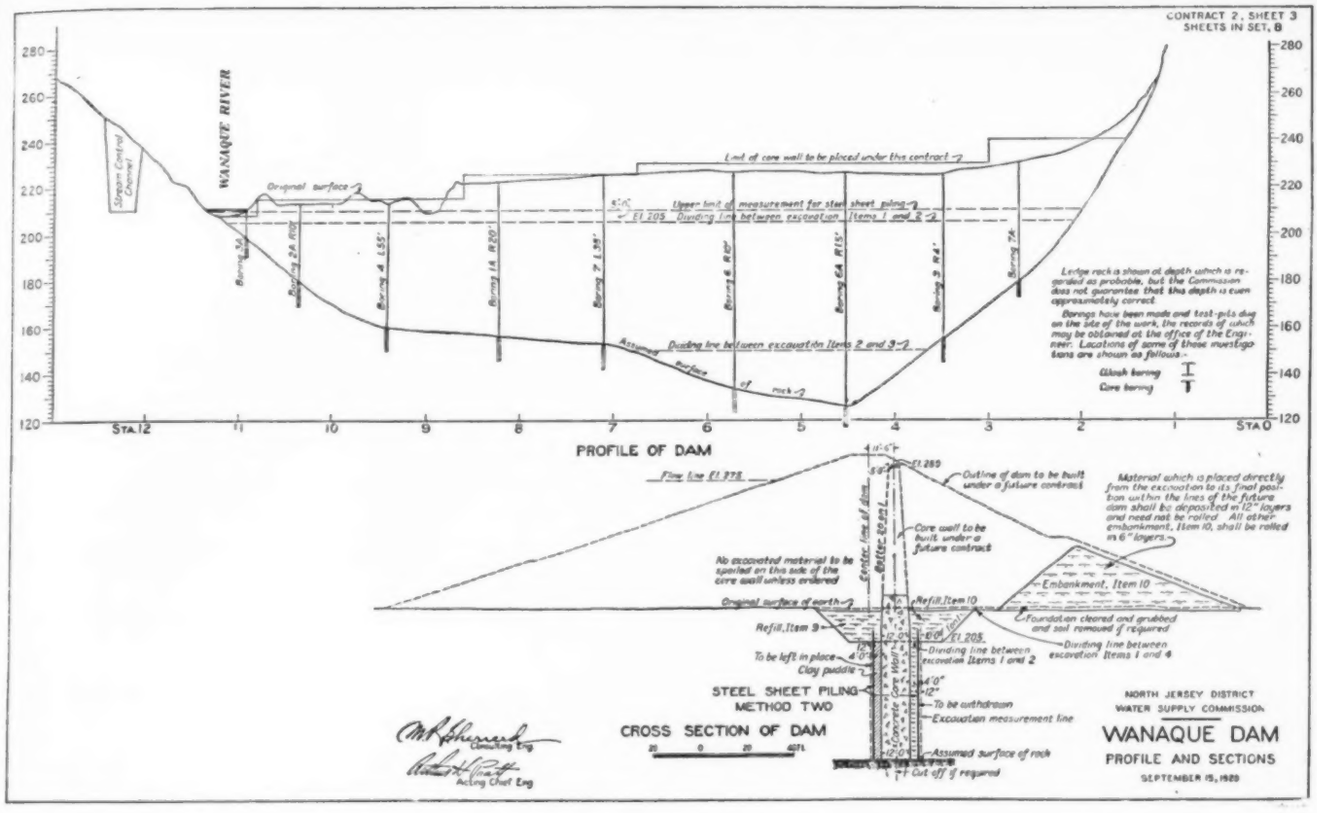
The contract was divided into two parts: first, the contract proper, i.e., the actual construction work and second, the incidentals such as freight, transportation of employees, small tools, bonds, erection of office, warehouses, hospital, etc. An estimate of the cost of the first part was made by the engineers and this estimate is used as a base. In making the estimate the labor scale and material prices prevailing at the time were made the base. The contractor is to receive a fee of 4 per cent on the base price only, due consideration being given to any fluctuations in the labor and material prices. Should the contractor effect a saving over the base price, he is to receive a certain percentage on such saving as a bonus. On the second part the contractor receives 4 per cent on the total cost.

A somewhat unusual clause in the specifications covers the use of animals, which is forbidden within the reservoir wherever it is practicable to employ traction engines, cableways, power excavators or other mechanical devices to do the same work.

In line with the above clause excavation was started



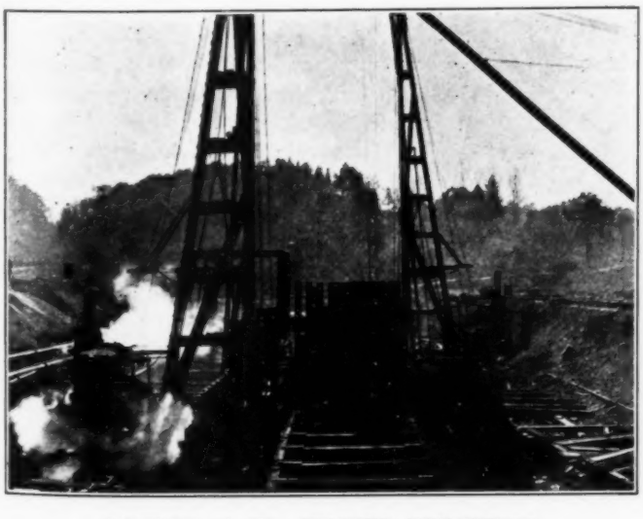
GENERAL VIEW OF CONSTRUCTION PLANT FOR WANAQUE DAM


CONTRACT 2, SHEET 3
SHEETS IN SET, 8
WANAQUE RIVER
Original surface
Limit of core wall to be placed under this contract
Upper limit of measurement for steel sheet piling
El 205 Dividing line between excavation Items 1 and 2
Dividing line between excavation Items 2 and 3
Assumed surface of rock
Ledge rock is shown at depth which is regarded as probable, but the Commission does not guarantee that this depth is even approximately correct.
Borings have been made and test pits dug on the site of the work, the records of which may be obtained at the office of the Engineer. Locations of some of these investigations are shown as follows:-
Wash boring
Core boring
STA 12
STA 0
PROFILE OF DAM
Flow line El 378
El 289
Outline of dam to be built under a future contract
Material which is placed directly from the excavation to its final position within the lines of the future dam shall be deposited in 12" layers and need not be rolled. All other embankment, Item 10, shall be rolled in 6" layers.
Core wall to be built under a future contract
No excavated material to be spoiled on this side of the core wall unless ordered
Original surface of earth
Refill, Item 10
Embankment, Item 10
Foundation cleared and grubbed and soil removed if required
Refill, Item 9
El 205
Dividing line between excavation Items 1 and 2
Dividing line between excavation Items 1 and 4
To be left in place
Clay puddle
STEEL SHEET PILING METHOD TWO
To be withdrawn
Excavation measurement line
Concrete Core Wall
Assumed surface of rock
Cut off if required
CROSS SECTION OF DAM
NORTH JERSEY DISTRICT WATER SUPPLY COMMISSION
WANAQUE DAM
PROFILE AND SECTIONS
SEPTEMBER 15, 1920

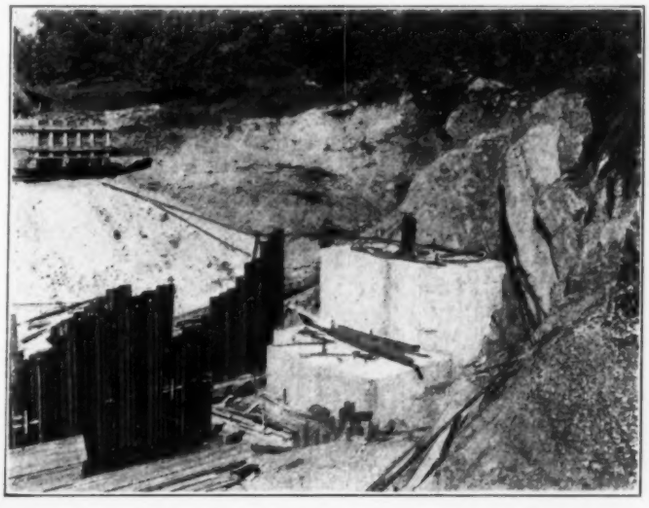
with a steam shovel and carried to ground water level to sufficient width so that two pile drivers could find room to work. Then two drivers operating 5-ton steam hammers working opposite started at the north end and continued the full length of the core-wall, as shown in one of the photographs. Steel sheathing in 50-ft. sections was first driven and then other 50-ft. sections were spliced to the first ones and driven down giving a total maximum penetration of about 90 ft. It may be added that this depth proved to be a maximum to which the sheathing could be driven in the gravelly soil. In some cases the points broomed out and refused a few feet before that depth was reached.

On account of the sandy nature of the soil and the amount of water carried by it, it was necessary to drive the sheathing before any excavation (below the water line) was made. After the sheathing was driven excavation was started and shoring and bracing carried on in the usual manner.

In the general view one of the four traveling derricks which run on rails the full length of the dam can be seen. These machines handle buckets, skips, clamshells, place reinforcing and also take care of the excavation between the two rows of sheathing.



DRIVING 90 FT. SPLICED SHEATHING



NORTH END OF CORE WALL. NOTE TUBES THROUGH WHICH GROUT IS FORCED BY COMPRESSED AIR

The concrete is mixed in a central mixing plant consisting of two 1-yd. mixers, steam driven. Bag cement is handled by belt conveyors from the cement house to the charging platform. The mixed concrete is conveyed to place in 2-yd. buckets on narrow gage

cars. Buckets are swung around by the derricks and emptied into vertical chutes for a maximum depth of 90 ft. Cement storage is provided for a week's run or about 1500 bbl. An abundant supply of gravel is dug close at hand by a steam shovel passed through a crusher and delivered to a stock pile in industrial cars. A guy derrick and clamshell charge the bins over the mixer from the stock pile.

When solid rock was reached, great care was used to seal up any crevices or cracks. After clearing holes were drilled to a depth of about 3 ft. Pipes 2 in. in diameter were placed in the holes and a blanket course of concrete about 2 ft. thick placed on the rock, the pipes sticking up as shown in the photograph. By compressed air grout was forced down through the pipes until a pressure of 100 lb. per sq. in. was reached. It is believed that this will seal all cracks and give a perfect bond on the rock bed.

An inspection of the profile showing the rock surface will give an idea of the irregular nature of the bottom. Seepage from the river at the south end and ground water presented a real problem. As many as 8 pumps, pulsometer and centrifugal, were used at one time—and even then concreting was difficult. In some places the contractor drilled through the steel sheathing and inserted well points. The streams of water would then enter the trench. This was done to pull the water away from the section and so reduce the head at that point. Another method used to avoid concreting in the water was first to concrete a small levee on the outside of the section to be poured. Then the section proper was carried up. The space outside the levee was next filled with stones covered up with bags of cement, and then concreted as usual.

The concrete core-wall up to the original ground level is to be completed this season after which the earth fill will be placed.

The design and construction are in charge of the North Jersey District Water Supply Commission for which Arthur H. Pratt is Chief Engineer, and Morris R. Sherrerd is Consulting Engineer. R. C. Young is superintendent for the contractors.

# CONSTRUCTION METHODS IN INDIA

By S. T. H.

LIFE in India presents many odd mixtures of the Oriental and the Western modes of living. The manner in which modern equipment is used along with the simplest hand-labor methods is always particularly striking to American construction men visiting India for the first time. On the opposite page are four pictures which give some ideas of how the new and the old ways are mixed on building jobs.

In Photograph No. 1, at the upper left hand, are shown the pre-cast concrete roof trusses for an important building in Bombay. While this type of construction is not extensively used, very satisfactory results have been secured with it. Great care is observed in casting and curing the trusses, special emphasis being placed on the retention of the reinforcing in its proper place until the concrete has set.

Pre-cast concrete piles also were used for the substructure of this building. The traveling pile driver which placed these piles is shown in Photograph No. 3. This view also shows some of the piles in place.

At the bottom of the page in Photograph No. 4 is a general view of two large buildings under construction. The unusually great story height is specially noticeable in the building in the foreground. This is common practice in building construction in hot countries all over the world, the extra height making the interior of the finished structure much cooler.

No special features of forming are evident on this particular job. At the right and left-hand corners of the building can be seen, however, the lashed bamboo scaffolding which is so common in the East. No nails are used. The bamboo is simply lashed together in a manner which gives a very strong, serviceable scaffold. Eastern workmen scramble over this scaffold like monkeys.

The thin, slow-moving oxen which draw the carts in which all materials are hauled may appear uneconomical to a Western construction man. He would probably want to use mules and four-wheeled wagons, or motor trucks. These cattle are immune, however, to most of the many virulent animal diseases of the tropics. They also subsist on very cheap feed and are handled by the lowest grade labor. While they would be out of place in the United States, these "bull carts" will be hard to oust in India.

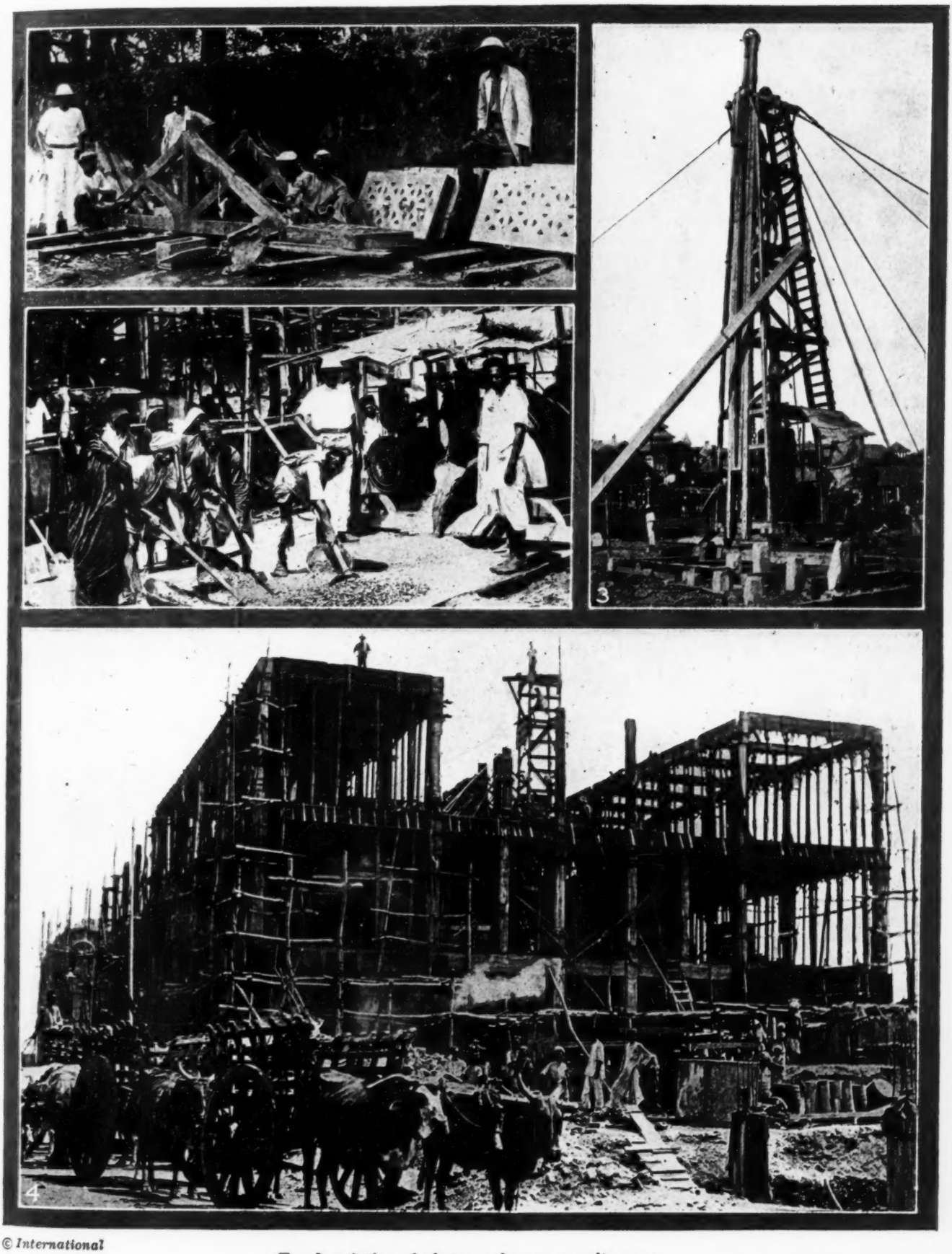
Concrete for the building was produced by a 7-cu. ft. mixer made in America. This mixer was placed in a shanty that may be seen in the central foreground of Photograph No. 4. A close-up of it is shown in Photograph No. 2. In the latter, it will be noted that the mixer discharges on a shoveling board. Men with hand hoes pull the concrete from this board into bowls about the shape and size of a wooden chopping bowl used in an American kitchen. Women carry the concrete in these bowls on their heads to place in the building. The tower shown in Photograph No. 4 is used for hoisting form lumber.

"What a chance to save money," says the American superintendent. Maybe — maybe not. The women work 10 hours for the price of a package of Fatimas. They deliver the concrete from the mixer to place at remarkably low costs.

"But, anyway, hand shovels would be better than the hoes." Again, maybe—maybe not. Wait until you have seen an Indian, or a Portuguese, or a Brazilian handle a hoe. The average of them will astonish most American foremen with the skill and speed they show in moving materials.

And so it goes in regard to many of the native methods used in India. These methods are better adapted to conditions as they have been there than more modern ways would have been. But slowly and surely the East is awakening. Builders out there are beginning to realize that modern equipment is a good investment for them for many reasons, even though labor is almost free.

# A Bombay "Skyscraper"



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For description of photographs see opposite page

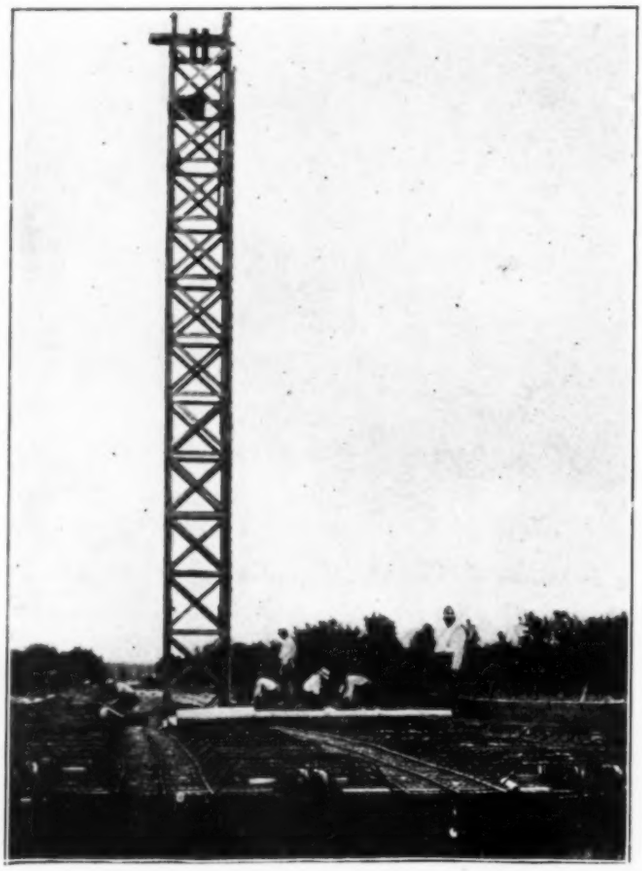
# TREE RETARDS PROTECT BRIDGE

## Wyoming Engineers Devise Way to Prevent Current from Damaging Structure

By J. F. Seiler, Bridge Engineer,
Wyoming State Highway Dept.

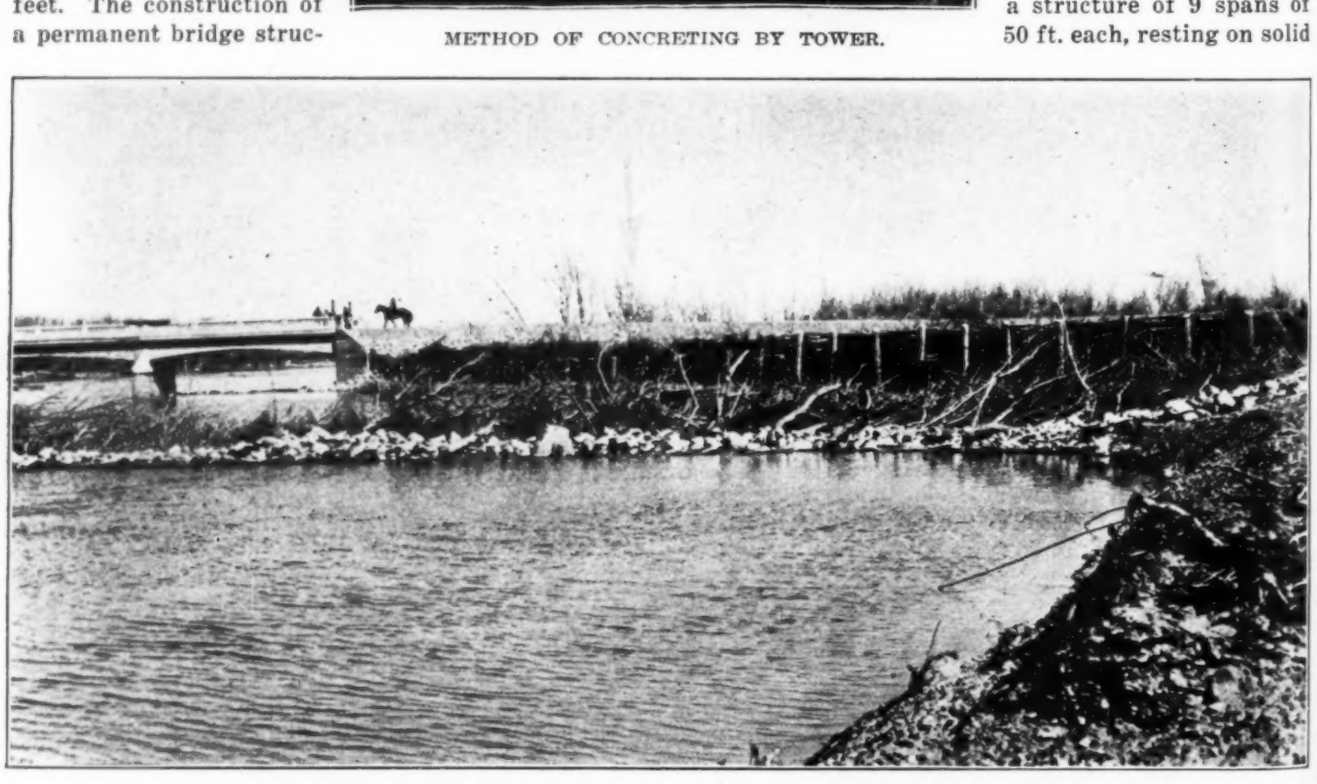
ONE of the principal needs of the community at Torrington, Wyo., for a number of years has been a suitable bridge structure across the North Platte River, inasmuch as most of the farming land tributary to Torrington lies to the south of the river and a recent Government opening of Public Lands now reached by irrigation added a vast area in the Goshen Hole, also tributary to this city. This recent land drawing brought some 200 families to Torrington or its immediate vicinity.

The old bridge structure constructed of wood and inconveniently located was a constant source of trouble, besides being unsafe during the high water periods, when the flow of the river has reached as much as 16,000 second feet. The construction of a permanent bridge structure offered no mean problems, due to the fact that the bed of the stream is pure sand as far down as one might wish to go, and with the very high velocity of the water during flood periods, it is obvious that the stream bed is liable to deep scour at any point where some small obstruction sets up a deflecting current.



METHOD OF CONCRETING BY TOWER.

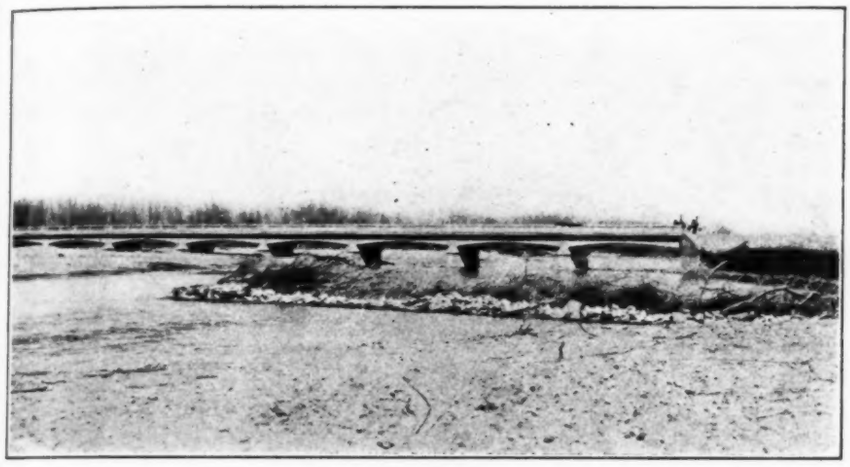
It was determined early that nothing except a structure of simple girder spans, where each part of the structure was an independent unit, was suitable for this location. The use of low, continuous arches, while economical to build, was rejected because scour around any pier, exposing the piling and rendering the pier unstable, might well endanger the complete structure. Hence the decision was made on a structure of 9 spans of 50 ft. each, resting on solid



VIEW OF SOUTH END OF COMPLETED BRIDGE SHOWING TREE RETARDS.

concrete piers and abutments with footings 5 ft. below the stream bed, and these in turn resting on wooden piling 20 ft. long.

Construction on this bridge was begun early in December, 1920, and continued until the early spring of 1922, when the entire structure, including a flood channel bridge of 2 spans similar to the spans of the main bridge, was completed at a cost of approximately $75,000. A long delay in construction activities was made necessary by flood waters, which came on early in 1921, together with the flow from the Pathfinder Reservoir, which kept the river at a high stage until October 1, 1921, after which construction was again resumed and carried to completion.



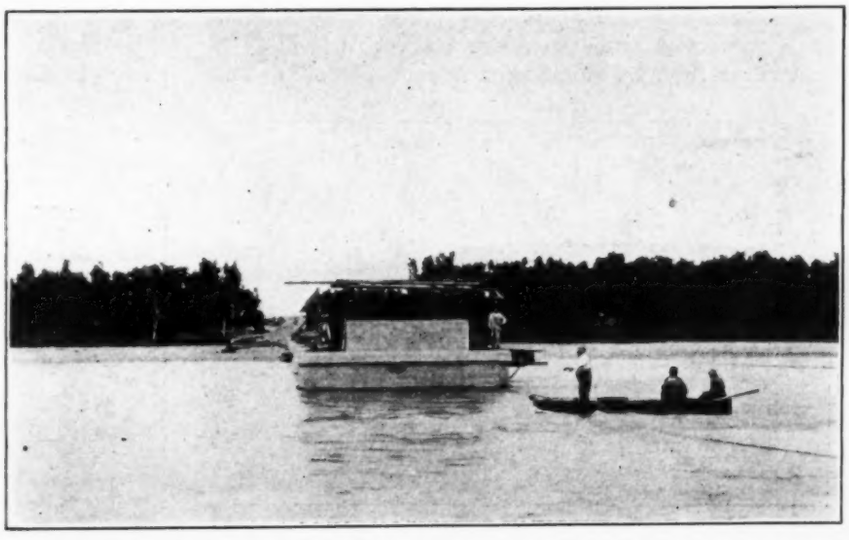
SAND BAR THROWN UP TO WITHIN TWO SPANS OF SOUTH END.

The greatest difficulty which was encountered during the construction of this bridge arose from the fact that in the early stages of flood water the south abutment was washed out before any of the superstructure had been concreted. At the same time several bridges in Nebraska, downstream from the structure, also were washed out by the exceedingly high stage. One of the photographs gives a view of part of the structure at this stage, the ripple on the surface of the water showing where the abutment had stood. The river at this time presented a sorry spectacle, one which gave much concern to the engineers who were responsible for the completion of this structure. Opinion was divided as to whether the abutment should be reconstructed at its present location, or whether one or more additional spans should be provided, but it was finally determined, after careful study and cost comparisons, to rebuild the abutment in its original location, and extend the roadway fill into what was then a part of the river, and this plan was carried out.

Relative to the scouring out of this abutment it may be said that just above the bridge site the river flows in a sweeping curve to the left, tending to throw the greatest current against the south bank. Unfortunately for the contractor, just at the critical time much of the false work for all the spans to the north was still in, none, however, being in the last span to the south, and as a result practically the entire flow of the river was directed to this span, the false work acting like a dam across the other spans. There could be but one result—the loss of the abutment—and this occurred, washing out also approximately 75 ft. of the embankment south of the same. The views show how the river was scoured out at this point, a high sandbar being deposited to the north, even past midstream.

After the structure was completed a good deal of work was done in the way of protection of the south bank, the principal items being the tree retards constructed of two layers of trees laid with trunks upstream, all cabled thoroughly to anchor piles, and the loose spaces filled with brush, rock, débris, etc. These retards extend out into the river at right angles to the bank a distance of from 50 to 150 ft. and are effective in deflecting the current away from the bank toward midstream. Within a very few days after construction a vast amount of silting in occurred directly behind the retards, thus building up the original bank. Some of the views illustrate the method of construction of the retards.

The structure as now completed gives a permanent crossing of the river at a point about one-half mile directly south of Torrington on a line with the main street of the town and thus serves the needs of the people of the valley and of the Goshen Hole District far better than did the old crossing 2 miles west.



LOOKING NORTH. RIPPLE BY BOAT SHOWS WHERE ORIGINAL ABUTMENT STOOD.

The design and construction of the Torrington Bridge, together with the protection work, was carried out under the direction of J. F. Seiler, Bridge Engineer; Z. E. Sevison, State Highway Engineer, and P. W. Warren, Resident Engineer.

# CONTRACTOR OPERATES HIS OWN QUARRY

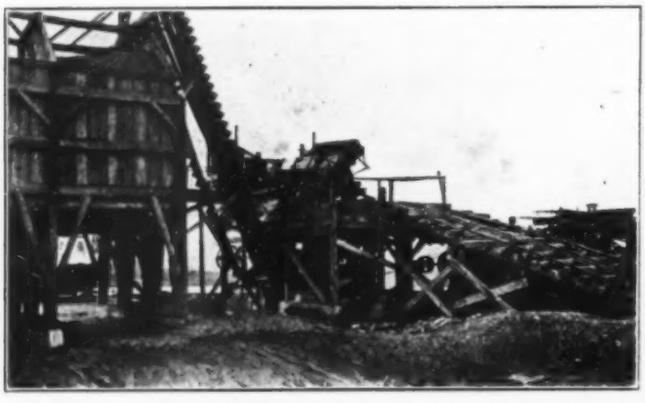
## Ohio Road Builder Employs Unusual Plan for Obtaining Jobs

By C. P. Burton

IN THE QUARRY. A LOADED DUMP CAR IS STARTING UP THE INCLINE TO THE CRUSHER

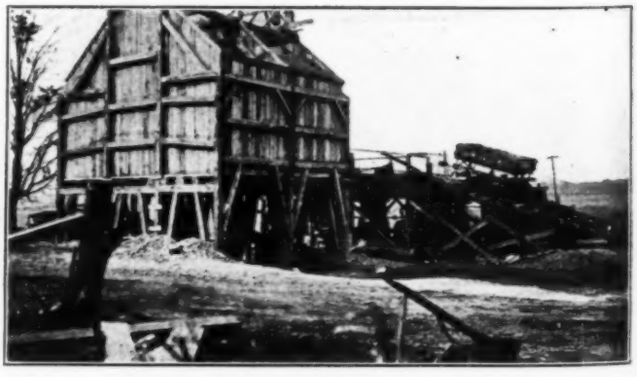
A ROAD builder down in Ohio, L. G. Rockhold of Mount Victory, has worked out a very ingenious plan for obtaining contracts, which is both unique and successful. He operates his own stone quarry, situated some 6 miles from the nearest railroad.

At first thought this seems a poor place for anything more than a most primitive quarry, but Mr. Rockhold does not find it so. Here is what he does, after opening his quarry far from railroad transportation: He goes after all contracts for building stone roads within a radius of 6 to 8 miles of his quarry and has everything his own way. Manifestly, any one else who desires to put in a bid for the work will have to include in his estimate of costs freight charges on crushed stone in addition to the cost of hauling to the road.



DUMPING A CAR OF STONE

By this simple plan the contractor avoids competition with commercial quarries and is able to build excellent roads with profit to himself and a saving to the county. He has opened three such quarries during the past 4 years and has his eyes on several promising sites for future operation, all of them situated the required distance from railroad transportation.



VIEW OF THE CRUSHING PLANT

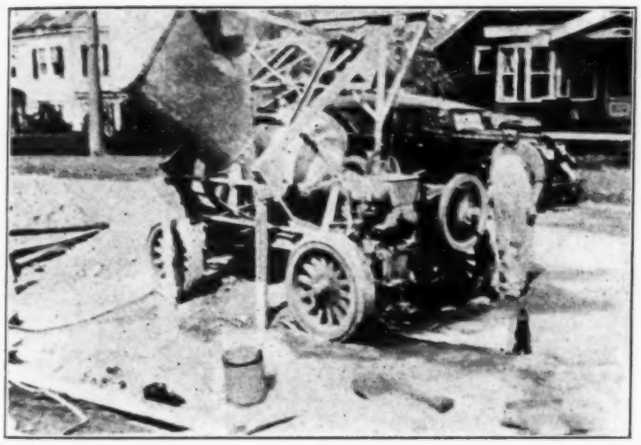
The latest of these quarries is at Byhalia, an inland Ohio town, which has no railroad. There a plant has

been established, which in production and economy would be a credit to many commercial quarries. A brief survey of his methods and installation will be of interest. The quarry is operated on a royalty basis and had been so operated before, but the previous owners made no money. The reason for their failure, as explained by Mr. Rockhold, is worth remembering. "They did not equip themselves," he says, "for economical operation on a quantity basis."

The new owner did so equip himself. The Byhalia plant is a marvel, considered as a local quarry. A production of 600 cu. yd. of crushed stone in a day of 22 hours is not unusual and a run of 450 cu. yd. in 11 hours has been accomplished. Two small steam shovels are kept busy—one on traction, 10 hrs. a day, stripping, and a caterpillar 22 hr. a day in the quarry, taking out rock. The crushing plant is close to the quarry. Three-yard side-dump cars, the best he could buy, are used for hauling the stone. They are loaded by the shovel and hauled up an inclined track by cable to the crushing plant where they are dumped. After crushing, the material is elevated to the screens, which separate it into two sizes, with no rejections—1 in. and under and over 1 in.

Quarry and crushing plant are operated 22 hr. out of the 24. During the day the crushed stone is loaded from bins into auto-trucks and hauled direct to the road under construction. About 1700 cu. yd. of stone to the mile are required and one mile of road is surfaced about every four days. The night shift dumps the stone into piles from which it is reloaded by machine into trucks the next day. Dump cars of the same size and make are used, with the other shovel in stripping. Mr. Rockhold says that his dump cars are rapidly paying for themselves and that he is well satisfied with the results obtained.

## RUBBER TIRES FOR MIXER



TO permit his concrete mixer to negotiate the pavements of southern Connecticut towns, R. Vogel has equipped it with sold rubber tires. The photograph shows the mixer in question; the axles and wheels were taken from an old truck and answer the purpose very handily.

## KEEPING UP THE MORALE

THE Juniata Company, contractors of Philadelphia, issues an eight-page pamphlet called The Juniata Company News, which is distributed among the employees of the company. A pamphlet of this sort is rather unusual for a road contracting company and this one contains a number of interesting items in regard to the work the company is building as well as the usual personal comments. It is an idea that other road contractors might well follow, as it undoubtedly helps to create "company feeling" among the employees who, of course, are scattered about on different jobs.

## TRADING IN OLD EQUIPMENT

IN a recent issue of the Nevada Highway News, published bi-weekly by the State Highway Department, appears a short article on the disposition of worn-out equipment. The Nevada Highway Department has adopted a policy of trading in its trucks, tractors, automobiles, etc., whenever they reach the limit of economic repair on new equipment of a similar character. It has been found that when the salvage value of a machine equals one-fourth of its original cost and that its repair to usable condition equals one-half of its original cost with continued operating cost about double that of a new machine, it is good business to turn in the machine as part payment for a new one. The lower operating cost will offset the first cost in exchange within two years. The machine will still give two to four years of further economical service before it again reaches the condition of the original machine. Then another replacement may be made.

## GETTING A BOULDER BACK INTO LINE

THE illustration shows how a steam shovel is bringing back within reach a big boulder which tried to get out of turn. The photograph was taken on the site of the new dam which is being built for

the International Paper Company across the Hudson River, near Glens Falls, N. Y., by the Parklap Construction Co. of New York City.

## FOR BREAKING UP THE SURFACE

THE accompanying illustration shows a sort of illegitimate plow which an excavating contractor in Connecticut has devised to loosen the material preparatory to loading it with a mechanical wagon loader.

The share is small and much heavier than that of

an ordinary plow. A wire rope is run through the clevis and by means of a special "nigger-head," which has been attached to the loader, the plow is drawn toward the loader. By means of this plow all the material, which is of a cemented gravelly nature, is made sufficiently loose so that the loader can pick it up without any further assistance. Two men with shovels merely feed the discs as the loader moves about under its own power.

The combination of plow and loader has satisfactorily solved the problem of getting the material into the wagons.

## AN OLD TIMER ON THE JOB

IN the transformation of an old macadam road into a bitulithic on a concrete base, the Newark Paving Co. tried out several methods and machines and none proved more satisfactory than that shown in the illustration.

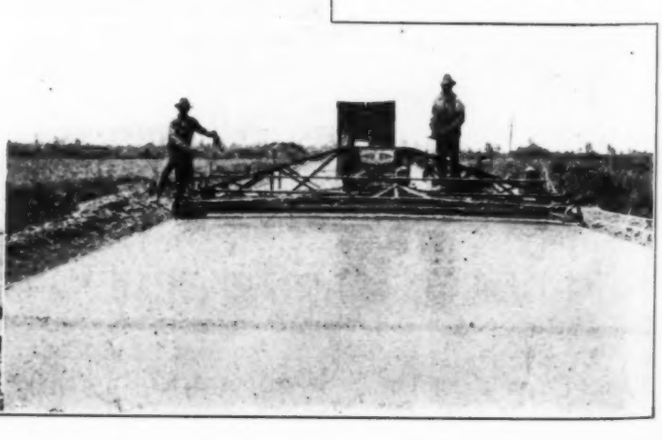
The road, which is known as the Deal-Elberon, is 20 ft. wide and it was necessary to excavate from 8 to 12 in. Without scarifying of any sort the contractor simply put a steam shovel which, by the way, has many years of service to its credit, and the teeth on the bucket managed to loosen up the hard surface for the bucket to pick up. In many cases large telford stones were encountered which were loosened

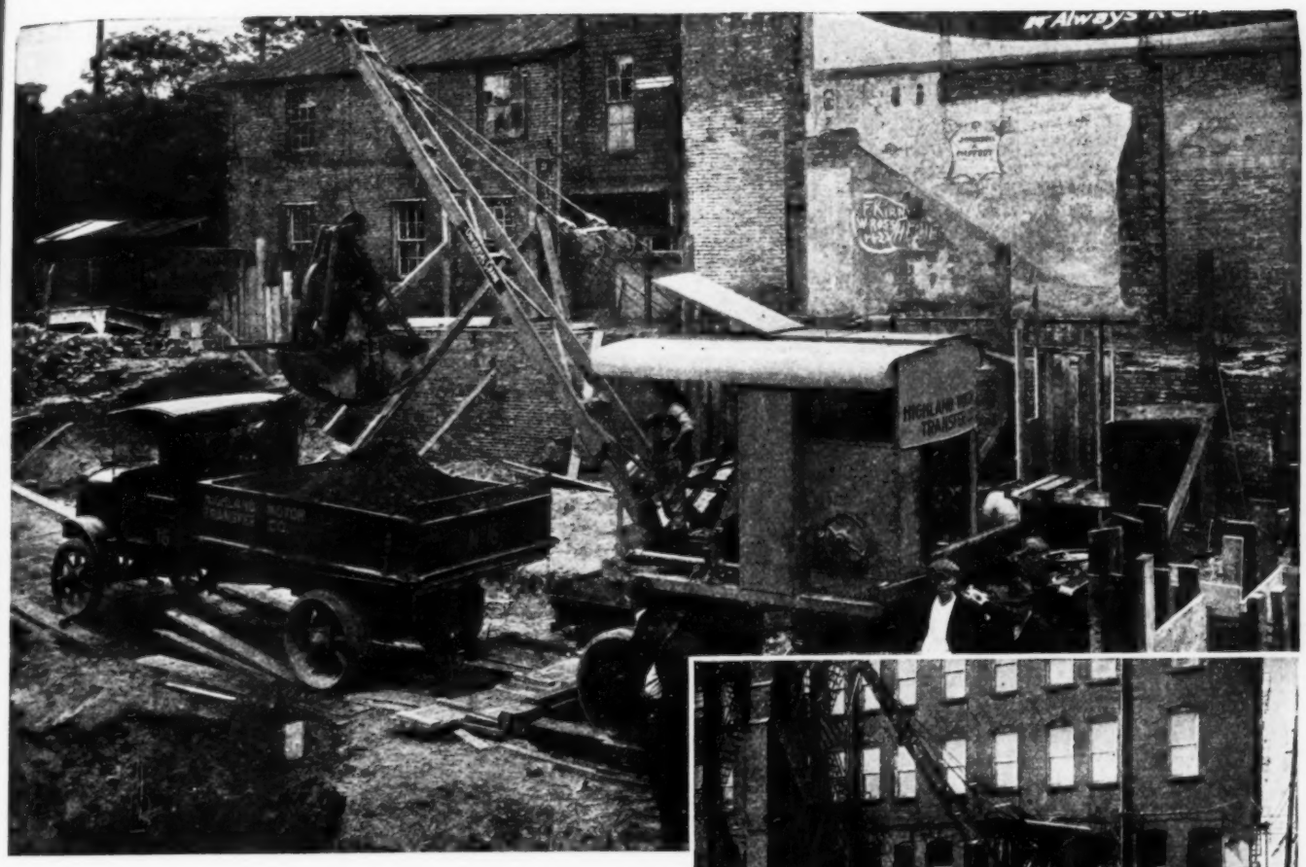
in a similar manner. In such cases the excavation was carried below grade, which was corrected by swinging the shovel in a circle between truck loads.

The progress averaged 200 lin. ft. of such scratch work a day, the record being 250 ft.

## ROADBUILDING IN MISSISSIPPI

THE accompanying photographs show the type of 18-ft. concrete roads that are being constructed in Washington County, Miss., under the supervision of the county and state highway engineers. During the winter months the highway shown was almost impassable, due to the fact that it was of black buckshot material, well known to all travelers throughout that section of the country. When completed the new road will be 34 miles in length. E. C. Wild is county engineer in charge of the road, assisted by J. S. Allen and W. C. Lindley, of the State Highway Dept.





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and is transferable from one to another.

*Our Catalogue 15-E illustrates and describes the different units.*

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"We bought those Westerns in 1912," said the foreman the other day, "and believe me we have kept them busy."

They showed wear but were still on the job 20 hours out of each 24.

Our dump car catalog No. S-51 explains why. Send for it.

## Western Wheeled Scraper Co.

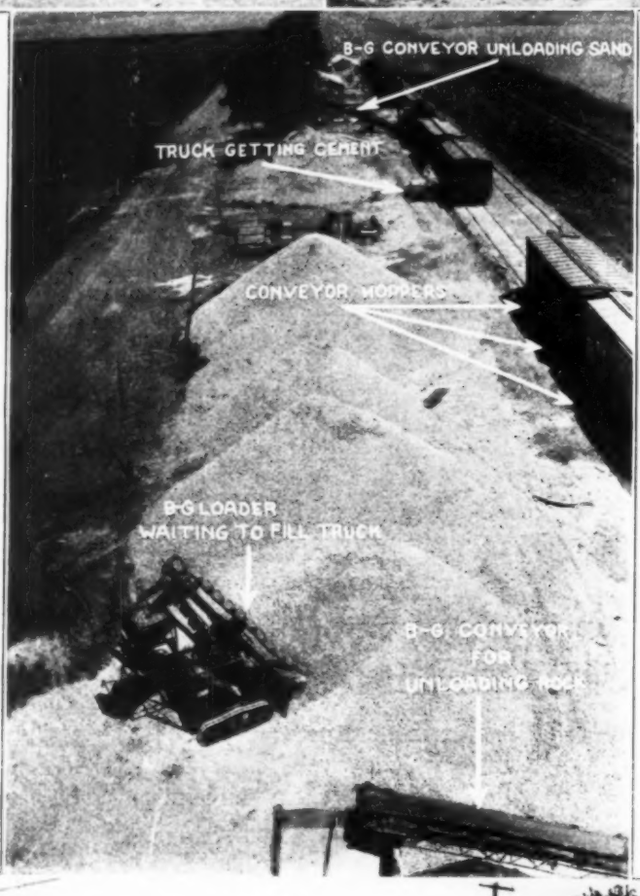
*Earth and Stone Handling Equipment*

**AURORA, ILL.**

# On Two Systems of Roadbuilding

Above:

B-G Conveyor unloading sand direct from car to bin. Storage piles formed by B-G Conveyor also.




Above:

B-G Loader and Conveyor. Load from storage when no cars to be unloaded.

Center:

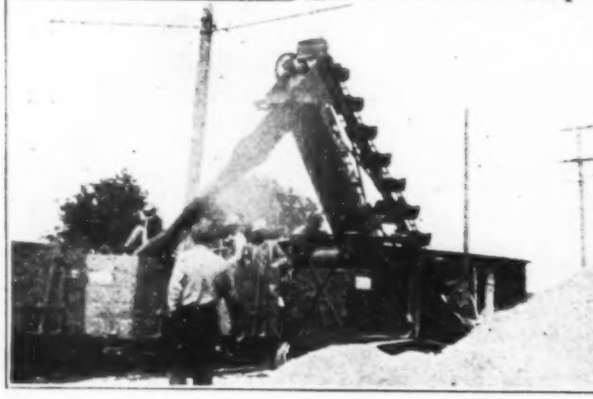
Birdseye view.

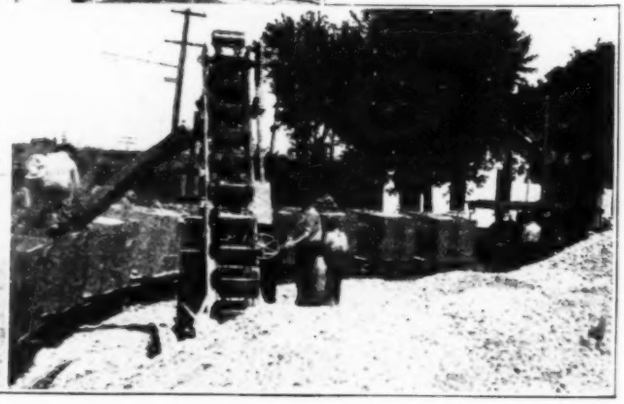
Below:

Loading industrial cars with sand.

Below:

Loading industrial cars with crushed rock.





# Meneely Uses Barber-Greenes

CONVEYORS in place of locomotive cranes are able to supply enough material to keep a five-bag mixer going and build up storage piles of sand and stone besides. One Barber-Greene Conveyor and three men frequently unload ten cars a day direct from cars to pile. No trouble getting the proper kind of cars when they can be unloaded so quickly.

Unloading from cars to bin goes as fast as is necessary to keep the trucks running. Capacity of the bin is 50 cubic feet, enough to keep the trucks going when an empty car is replaced with a full one. The conveyor keeps ahead of the trucks by keeping the bins filled at all times. From it a truck can be loaded with a batch of 10 cubic feet in 20 seconds.

A maximum of 835 lineal feet of concrete pavement 18′ x 8″, with an expansion joint in the center and reinforcing rods at the edges, has been laid in a 10-hour day. Barber-Greene equipment gives high loading speed with low overhead cost.

As shown, Meneely uses Barber-Greene Loaders on his industrial haulage job also. Speed and efficiency are maintained without locomotive cranes, tunnel systems or large bins—equipment which has high overhead costs always.

These two Meneely jobs are good illustrations of the adaptability and efficiency of Barber-Greene equipment. On his next contracts, Meneely knows that he can use one system as readily as another, because his loading plant is adaptable.

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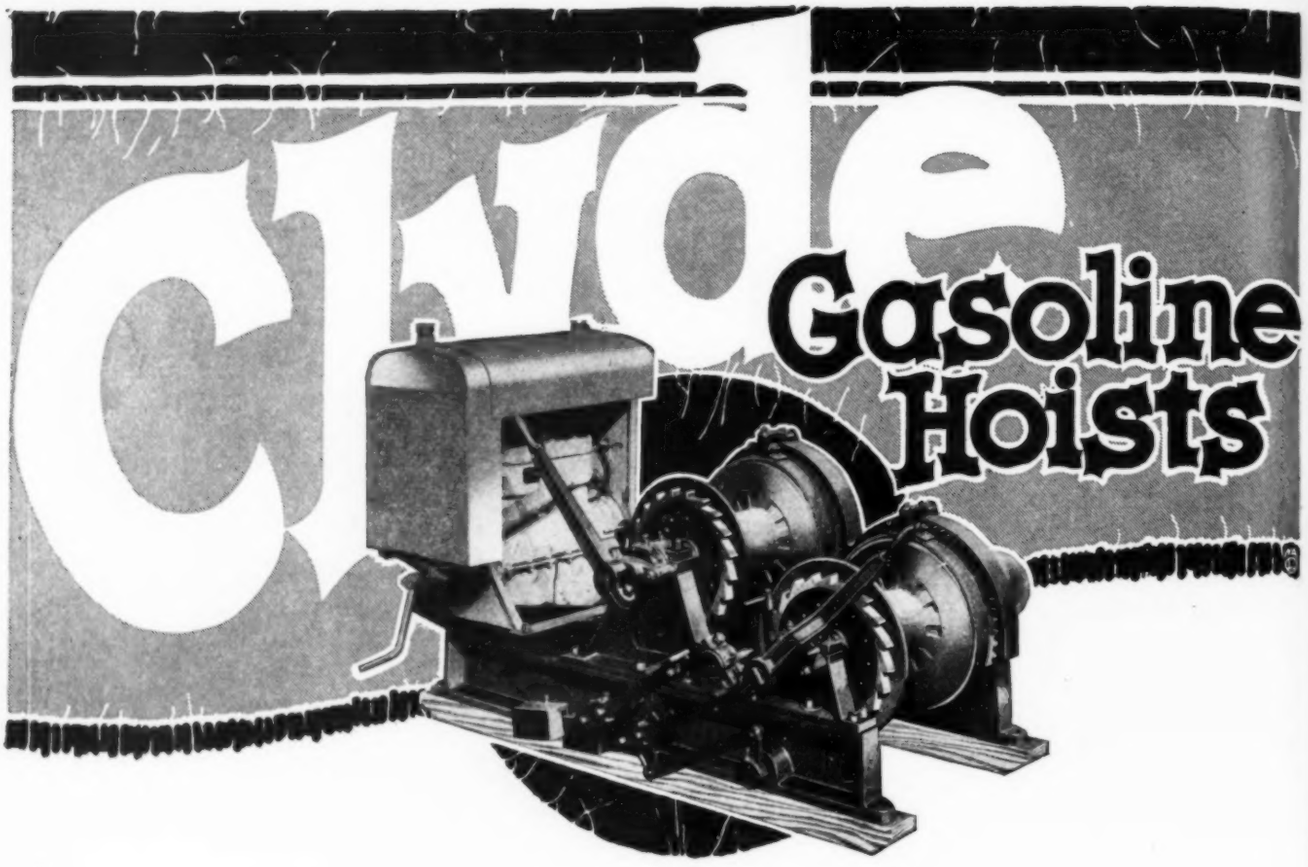
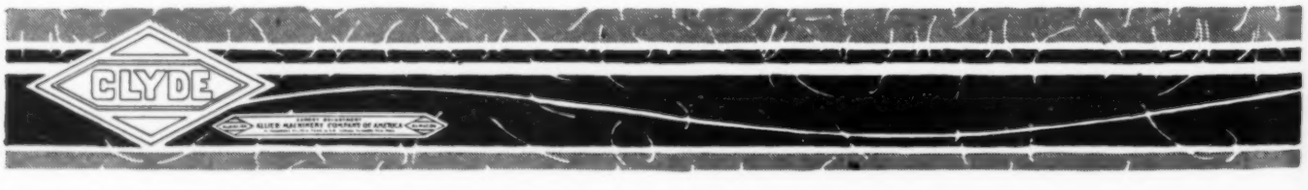
Company .....
City ..... State .....




Although the Clyde Line of Hoisting Equipment has long been recognized as the world's quality standard, it has been the constant endeavor of Clyde Engineers to secure an ever-better product. It was this ambition which brought out the improvements found in the new silent chain-drive gasoline hoists.

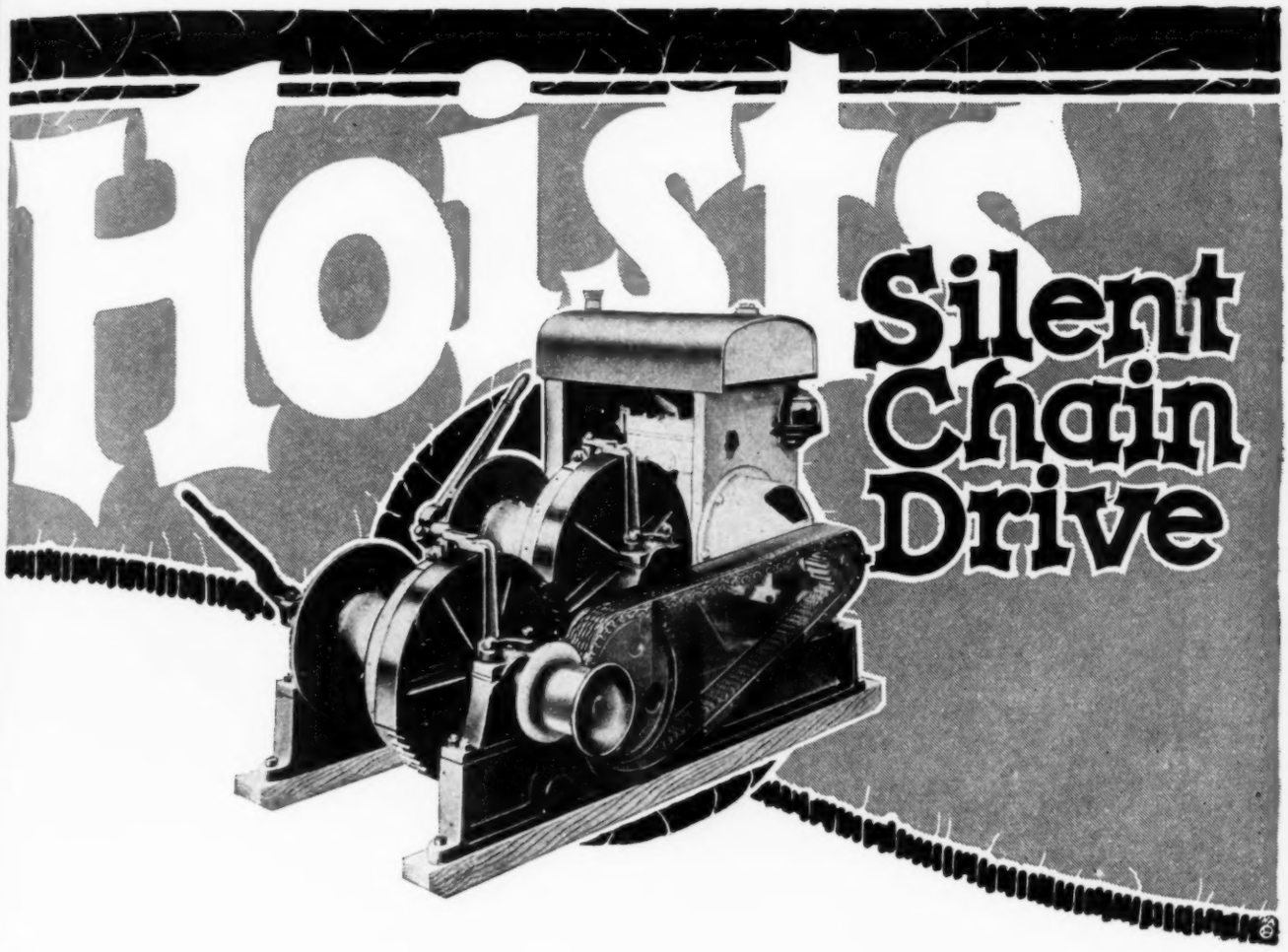
Incorporating all of the quality features found in previous Clyde hoists, this new engine with its improved motor and chain drive offers much higher efficiency, and greatly simplified methods of operation. The silent chain is made up of a series of leaves or plates, the joints of which consist of segmental case hardened liners or bushings with pins. This gives almost noiseless action, the chain fitting against the cut gear teeth without play. Do not confuse this type of chain with the ordinary malleable cast drive chain which is usually used for slow drive on cement mixers and similar equipment. The new engine is provided with a muffler and meets all civic regulations regarding noise.

Never in the history of the Clyde has any new machine met with the instantaneous favor that has been accorded this silent chain-drive engine. The demand has come from all sections of the country and stands as a complete endorsement of its merits.




# THE CLYDE LINE

*Steam Hoists* *Electric Hoists* *Gasoline Hoists* *Belt Hoists* *Derrick Fittings*
*Steel Derricks* *Excavators* *Traction Cranes* *Blocks and Sheaves* *Logging Machinery*



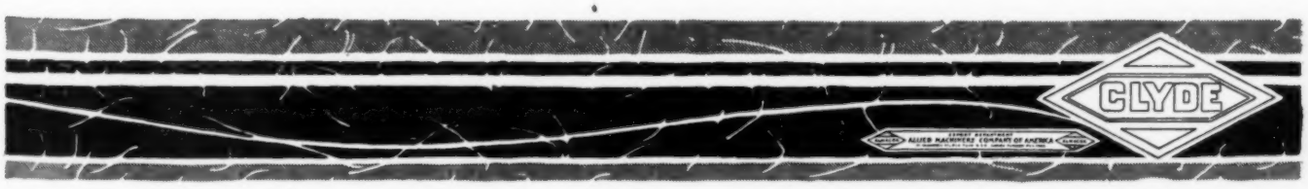

Shown above is the 15 horsepower, two drum, Silent Chain Drive Gasoline Hoist which is meeting such instant popularity with contractors everywhere. It will handle a single line load up to 2,000 pounds.

A powerful and efficient motor is used, which lends itself particularly to continuous service and greater output. Machine cut gears, together with drums, side stands and bed of semi-steel tend to produce an exceptionally sturdy unit, which will stand up to the most rigid tests.

The hoist is shipped fully equipped with foot brakes, ratchets and pawls and a winch head on the forward shaft. The gasoline motor is provided with fuel tank, radiator, fan, magneto, carburetor, speed governor, air washer and muffler.

The new Clyde Silent Chain Drive gasoline hoists are built with one, two or three drums, and in 8, 15, 20, 30 and 50 horsepower.

*Full information given cheerfully about this or any other unit of the Clyde Line.*




## CLYDE IRON WORKS SALES COMPANY

**Sole Distributers for CLYDE IRON WORKS, Duluth, U. S. A.**

Branch Offices and Warehouses:

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|---|---|---|---|---|---|
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# WILLIAMSPORT WIRE ROPE

—Telfax Tape Marked is standard equipment on these new Orton & Steinbrenner shovels.

When a manufacturer features Williamsport Wire Rope, Telfax Tape Marked, on his equipment he has gone the *limit* to give you *quality* and he wants you to know it, he is worthy of your *highest confidence.* He could give you much *cheaper* rope and you would never *know* the difference by *looking* at it.

Williamsport is the *only* wire rope made, each grade of which is *distinctly marked* so that all may see it.

Let your next replacement be Williamsport.

## WILLIAMSPORT WIRE ROPE COMPANY

**Main Office and Works:**
**Williamsport, Penna.**

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*"accepted as the best"*

C.H.&E.
WHITE CONSTRUCTION CO. Chicago Ill.
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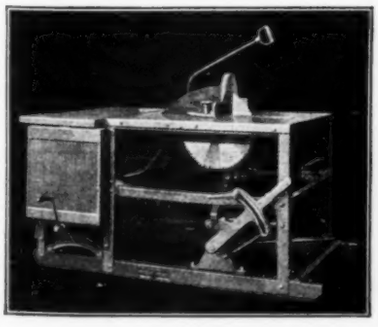
THE WHITE CONSTRUCTION CO. of Chicago have great confidence in CH&E Triplex Pumps. Four No. 9 Triplex Pumps shipped on one order. On any road job, look for the pump and you will find a CH&E outfit delivering the water. We also manufacture Portable Saw Rigs, Hoists, Elevators, Tractors, Diaphragm, Piston, Centrifugal and Triplex Pumps, Engines.

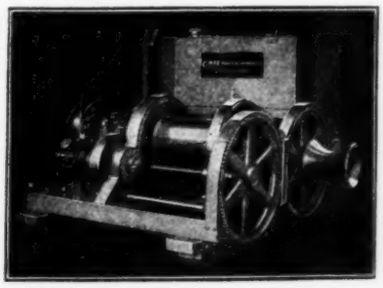
You should have our new catalog just off the press.

**C. H. & E. MANUFACTURING CO., INC.**

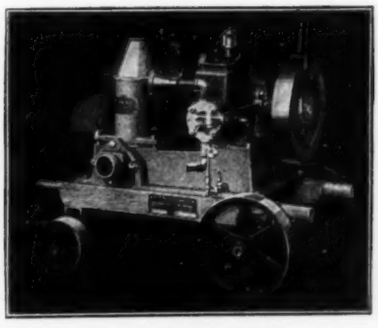
**384-A CLINTON ST., MILWAUKEE, WIS.**



*No. 15 Saw Rig.*

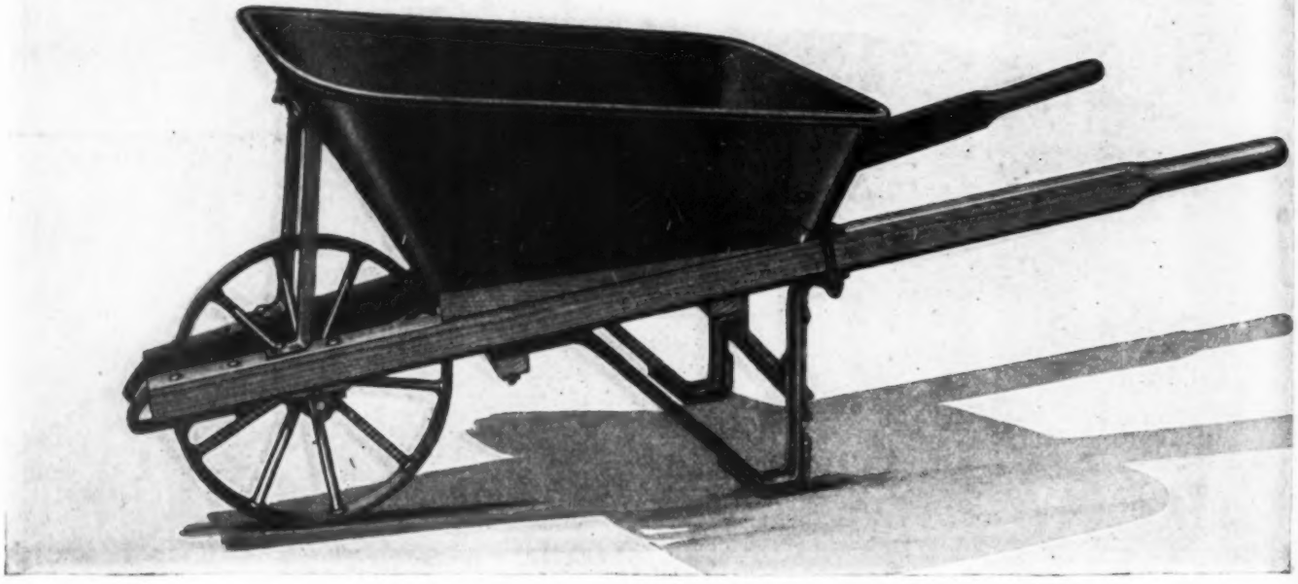


*No. 7 Reversible Hoist.*

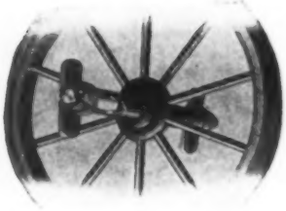


*No. 4 Bilge Pump.*

*All Sterling Barrow parts are interchangeable*



# THE WHEEL IS ONLY ONE



There are many more improvements in wheelbarrow construction which are exclusively "Sterling," and which mean longer and better service. All Sterling wheels have 10 spokes—steel hubs—smooth surface tires. All Sterling wheels are equipped with self-lubricating bearings which greatly lessen the effort of wheeling.

*They Make a Hit With Your Men—Ask Your Foreman*

**Sterling Wheelbarrow Company**

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# No matter where your work is—you can get quick delivery of Sterling Barrows from some near-by stock.

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# Thew Shovels Take Prominent Part

## *Owners and operators unanimous*

### A Few Comments

"I can turn out more yards with it than any other machine I ever saw. In the last seven months we have completed 4½ miles of roads and cut 4½ miles of creek channel 22 ft. wide and 8 ft. deep." *(West Virginia.)*

"We moved 800 yards in eight and one half hours." *(Ohio.)*

"Loaded 220 wagons and moved machine three times in three hours and twenty minutes. If any other shovel on the market will do this, I want to see it." *(Pennsylvania.)*

*Thew*
*Power Shovels*

*Three Thews Tackling a Big Job*

Of four shovels used on this job, three were Thews. They made quick work of over 25,000 cubic yards of excavation. Winter digging too, with over a foot of frost in the ground.

No extraordinary records are claimed for this work. The Thews did their part well and demonstrated as usual that they are consistent producers and are the most economical on the job.

The advantages of the Type O over other ¾ yd. shovels are widely recognized. They have greater range, power, flexibility, endurance and speed.

The standard 19'6" plate girder shipper shaft boom gives the longer reach that enables the Thew to load higher on the bank or farther ahead on a level. The single oak stick with ship channel reinforcement obviates spreading and allows extension to the limit.

Sturdy and powerful engines, flat on turntable and boom operate the

## THE THEW SHOVEL CO.

# In Nationwide Construction Activity

## *in their praise of Thew performance*

*At Work on New Masonic Temple, Detroit*

### By Thew Owners

"Loaded 766 one and one half yard wagons in 9¼ hours." *(Ohio.)*

"The lift was too high for his shovel. It absolutely refused to do it and the job was a hurry up one. So he called me in with my Thew and we finished in plenty of time and with no trouble at all." *(Missouri.)*

"We loaded 88 1½ yd. wagons with it in one hour." *(Ohio.)*

The shovel in each case is a Type O (¾ yd.) Thew. These men have enjoyed reading Bulletin 111. Have you sent for your copy?

**Thew Power Shovels**

shovel without vibration. The Thew crowding mechanism with its auxiliary gears prevents any tendency of the dipper to drift back no matter how heavily loaded or far extended.

Whether moving up, changing mats, hoisting, crowding or swinging, every operating motion is instantly and easily controlled by the engineer. He can use three or four levers as he sees fit.

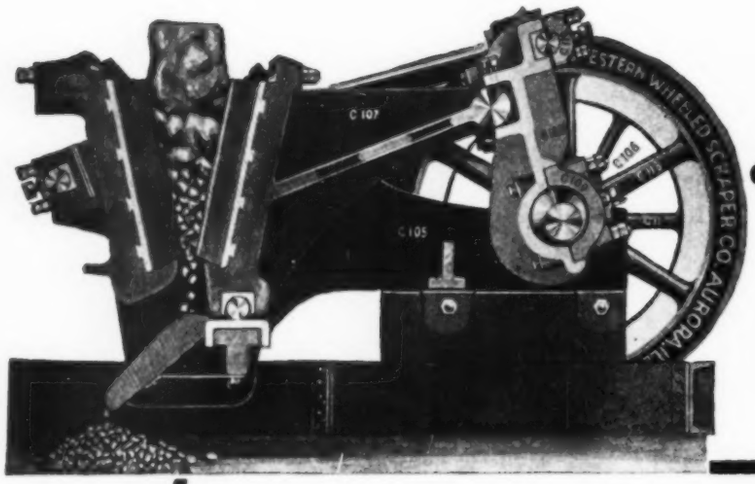
As for endurance. One of these three shovels has been in service over ten years. That tells its own story.

Thew speed is reckoned by consistent yardage. It is built for work and not lever juggling. Day by day output, job after job completed in record time with a minimum of "hours out" for repairs put the Thew in a class by itself.

There is a bulletin that covers each Thew type. Write for your copy.

FULTON RD., LORAIN, OHIO

# Western-Aurora




## *The Jaw Crusher that is Different*

IF YOU are familiar with the design of all other jaw crushers you will see at once from the sectional view of the Western-Aurora that it is unique in several respects.

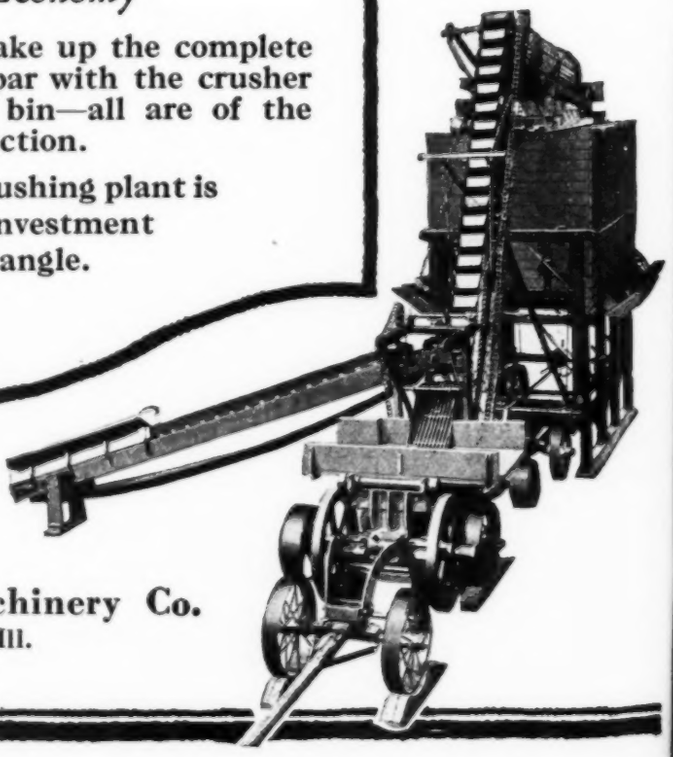
Among other distinctive features, the Western-Aurora has a continuous double stroke crushing motion and a form of construction with no springs to break or toggles to drop out. As a result this crusher excels in

| | |
|---|---|
| *Capacity* | *Simplicity* |
| *Efficiency* | *Durability* |
| *Reliability* | *Economy* |

Other units that go to make up the complete crushing plant are on a par with the crusher itself. Elevator, screen, bin—all are of the most substantial construction.

A Western-Aurora crushing plant is a mighty fine investment from every angle.

THE AUSTIN-WESTERN LINE · IT SERVES YOU RIGHT ·



*Send for catalogue No. 44-X in which these plants are illustrated and described in detail.*

**The Austin-Western Road Machinery Co.**
400 N. Michigan Blvd., Chicago, Ill.

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